



THIRD QUARTER MONITORING REPORT
JULY TO SEPTEMBER 2001
KIN-BUC LANDFILL OPERABLE UNITS 1 AND 2

Prepared for
SCA Services, Inc.
Edison Township, Middlesex County, New Jersey
October 2001

Prepared by
EMCON/OWT
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, New Jersey 07495

OWT Project 791186

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EXECUTIVE SUMMARY

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which the USEPA placed on the National Priorities List (NPL) in 1981. A Remedial Investigation/Feasibility Study (RI/FS) was conducted between 1983 and 1988 which resulted in a Record of Decision (ROD) by USEPA in 1990 that called for source control of Operable Unit 1 (OU1).

The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall. Remedial construction activities for OU1 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted on a quarterly basis to evaluate the effectiveness of the remedial actions. This report documents the results of the monitoring activities for the Third Quarter of 2001.

Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The primary objective of the leachate collection system is to impose an inward gradient as measured across the slurry wall in the refuse unit. The primary objectives of the groundwater collection system is to prevent migration of contaminated groundwater towards the slurry wall and impose an upward gradient from the bedrock unit to the sand & gravel unit.

Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of leachate and groundwater collection systems. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall and 4 pump stations. The groundwater collection system consists of 4 pumping wells.

The hydraulic monitoring system for OU1 is located along the circumferential slurry wall with many of the wells located in 5 clusters, called transects. The hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic unit, with 1 well inside and 1 well outside the circumferential slurry wall. Twenty-four of the monitoring wells are continuously monitored using water level recorders.

The hydraulic monitoring network consists of wells screened in the refuse, sand & gravel, and bedrock units. Well designations of G, S or R, denote hydraulic units of refuse, sand & gravel or bedrock, respectively.

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area.

Third Quarter Hydraulic Monitoring Activities

Manual groundwater elevation measurements were obtained and continuous water level data downloaded from the monitoring wells in OU1 and OU2 during site visits on July 5, August 14, September 5, and October 1, 2001.

Hydraulic monitoring indicates that intragradient conditions in the refuse unit (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at TL Nos. 3, 4 and 5, throughout the quarter. The average flow condition in the refuse unit at TL No. 2 was intragradient throughout the quarter.

Intragradient conditions in the sand & gravel unit (lower water levels in the sand & gravel unit inside the slurry wall relative to water levels outside the wall) were maintained at TL Nos. 3 and 4, throughout the quarter. The average flow condition in the sand & gravel unit at TL No. 2 was intragradient throughout the quarter, although there were periods where intragradient conditions were not observed. On average, upward gradient conditions between the bedrock and the overlying sand & gravel deposits were observed at the TLs inside of the slurry wall throughout the quarter with the exception of TL No. 2.

The synoptic groundwater elevations obtained during the Third Quarter of 2001 indicate both upward and downward hydraulic gradients between the different geologic strata.

Leachate Withdrawal/Groundwater Pumping

Groundwater was collected from S&G Wells 1, 2, 3 and 4, at an average rate for the quarter of 15,788 gpd. The total volume of groundwater collected for the quarter was 1,452,486 gallons. Leachate was collected at an average daily rate of 1,231 gpd for the quarter, and the total volume of leachate collected was 113,255 gallons. Both groundwater and leachate collection were generally consistent with recommended withdrawal rates.

Landfill Gas Monitoring

Combustible gas was not detected in any of the 6 gas monitoring wells located on the north side of OU1. Based on the non-detection of combustible gas in the monitoring wells, the active gas collection system is functioning properly and there is no apparent off-site gas migration. Monitoring at the flare inlet port by landfill personnel throughout

the quarter indicated that the landfill gas collection system was delivering an average of 48.9 percent combustible gas to the flare.

1 INTRODUCTION

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which operated under a New Jersey Department of Environmental Protection (NJDEP) permit until 1976. The USEPA placed the Kin-Buc Landfill on the National Priorities List (NPL) in 1981. Between 1983 and 1988, the Respondents conducted a Remedial Investigation/Feasibility Study (RI/FS) which resulted in a Record of Decision (ROD) by USEPA in 1990 which called for source control of Operable Unit 1 (OU1), and an additional RI/FS to determine the nature and extent of contamination outside the source area, thus defining Operable Unit 2 (OU2).

Operable Unit 1 includes both Kin-Buc I and II Mounds, the former Pool C Area and a portion of the Low-Lying Area between Kin-Buc I and the Edison Landfill. The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall.

Operable Unit 2 includes Mound B, Edmonds Creek and adjacent wetlands, the remaining Low-Lying Area between OU1 and the Edison Landfill, Martins Creek, and the Raritan River. The OU2 ROD called for the excavation and disposal of PCB-contaminated sediments from within the Edmonds Creek Marsh Area, the restoration of disturbed wetland areas, and groundwater/surface water monitoring.

Remedial construction activities for both OU1 and OU2 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted quarterly to evaluate the effectiveness of the remedial actions. This report documents the results of the monitoring activities for the Third Quarter of 2001.

2 DESCRIPTION OF MONITORING PROGRAM

2.1 Hydrogeologic background

The primary hydrogeologic units within OU1, from ground surface downward, are refuse, meadow mat, sand & gravel, and bedrock. Near the northern portion of the site the bedrock is closer to the surface and there is no sand & gravel unit in that area.

The southern portion of the site is located in close proximity to the Rartin River. As a result, monitoring wells located on the southern side of OU1 are impacted by tidal fluctuations.

2.2 Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The specific remedial objectives for the leachate collection, groundwater collection, and hydraulic monitoring are summarized as follows:

Aqueous Leachate Collection

- Primary
 - Collect leachate from the refuse unit within the perimeter slurry wall to impose an inward gradient as measured across the slurry wall (hydraulic containment).
- Additional Benefit
 - Reduce the downward gradient between the refuse unit and the underlying sand & gravel or bedrock units.

Sand & Gravel Groundwater Collection (in Primary OU1 Containment)

- Primary
 - Prevent migration of contaminated groundwater towards the slurry wall.
 - Impose an upward gradient from the bedrock unit to the sand & gravel unit (hydraulic containment).
- Additional Benefit
 - Impose an inward gradient within the sand & gravel unit as measured across the perimeter slurry wall (hydraulic containment).

Sand & Gravel Aquifer Groundwater Collection (in Oil Seeps Area Containment)

- Collect sand & gravel groundwater from within the Oil Seeps Area if an upward gradient between the sand & gravel and the refuse units cannot be imposed by leachate collection alone.

2.3 Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of 4 leachate pump stations, and 4 sand & gravel groundwater pumping wells. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall. In addition, a corrugated oily leachate collection conduit is located along the south side of Kin-Buc I mound. The layout of the collection system is shown on Drawing 1.

The hydraulic monitoring system for Operable Unit 1 is located along the circumferential slurry wall with many of the wells located in 5 clusters, called transects. The OU1 hydraulic monitoring well network consists of 11 wells screened in the refuse/fill, 8 wells screened in the sand & gravel, and 10 wells screened within bedrock. A summary of the well network is provided in Table 2-1, and the well locations are shown in Drawing 1.

The hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic unit, with 1 well inside and 1 well outside the circumferential slurry wall. The design of the well network allows groundwater elevations to be monitored on either side of the slurry wall and provides data to evaluate the performance of the slurry wall as a hydraulic barrier.

At TL Nos. 2, 3 and 4, the hydraulic monitoring wells are installed in the refuse, sand & gravel and bedrock units. At TL Nos. 1 and 5, the hydraulic monitoring wells are installed only in the refuse and bedrock units due to the absence of sand and gravel

deposits in these areas. Wells designations of G, S and R, denote hydraulic units of refuse, sand & gravel and bedrock, respectively

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area. The hydraulic monitoring system for OU2 consists of 16 wells, as indicated in Table 2-2 and as shown on Figure 2-1. Water elevation measurements from the OU2 wells are taken manually, concurrent with the OU1 monitoring activities.

2.4 Third Quarter Hydraulic Monitoring Activities

Monitoring and sampling for the Third Quarter of 2001 (July to September) took place according to the procedures and methods outlined in the Draft Operations and Maintenance (O&M) Manual for the Kin-Buc Landfill, prepared on behalf of the Respondents by Wheelabrator EOS in September 1995 and modified by a letter to EPA dated February 28, 1996.

Components of the hydraulic monitoring program consist of continuous and manual water level measurements. Manual measurements were obtained with an electronic water level indicator. Continuous water levels were obtained at 1-hour intervals using 23 In-Situ "Trolls", Model SP4000 data logger and transducer, and 1 In-Situ "miniTROLL", Model SSP-100 data logger and transducer.

During a site visit on August 14, 2001, the Troll in Well 13G, outside the wall, malfunctioned and data was not collected due to downloading problems between the data recorder and computer. On September 5, 2001, the Troll in Well 13G was removed and a new miniTroll was installed into the well. Also, on September 5, 2001, data was not collected from Well 15G, inside the wall, due to downloading problems between the data recorder and the computer. Data in Well 15G was collected until August 14, 2001. The Troll in Well 15G was removed, and it is anticipated that a new miniTroll will be installed in the well during the next site visit in November.

Manual groundwater elevation measurements were obtained from the monitoring wells in OU1 and OU2 during site visits on July 5, August 14, September 5, and October 1, 2001. The manually-recorded water level monitoring results are provided in Table 2-3.

Three months of continuous water level data have been obtained from the refuse and sand & gravel wells at the site from July 1, 2001 to September 30, 2001. The minimum and maximum recorded water elevations for each month in the quarter are provided in Table 2-4. Continuous groundwater elevation graphs organized by transect location and hydrogeologic unit are provided in Appendix A. Evaluations of the recorded data are performed on a monthly basis. Copies of these monthly evaluations are provided in Appendix B.

2.5 Continuous Hydraulic Monitoring Results vs. Manual Elevation Measurements

The continuous water level monitoring information collected by the Trolls was compared with the data collected from the 3 manual recordings to provide information on the relative accuracy of manual versus automatic recordings. Table 2-5 shows the difference between the 3 manual water level elevation measurements and Troll recordings for the same day and hour. Differences between the manual and continuous measurements were below 0.3 feet for all wells except Well 7S, which was 0.34 feet. Based on the comparison above, the data recorded by the Trolls is satisfactory and reflects accurate groundwater elevations.

3 HYDRAULIC MONITORING

A summary of the Third Quarter hydraulic profile is provided in Figure 3-1. Intragradients in the refuse unit (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at TL Nos. 3, 4, and 5 throughout the quarter. The average flow condition in the refuse unit at TL No. 2 was intragradients throughout the quarter, although there were periods where intragradients conditions were not observed. Intragradients conditions in the sand & gravel unit (lower water levels in the sand & gravel unit inside the slurry wall relative to water levels outside the wall) were maintained at TL Nos. 3 and 4 throughout the quarter. The average flow condition in the sand & gravel unit at TL No. 2 was intragradients throughout the quarter, although there were periods where intragradients conditions were not observed. On average, upward gradient conditions between the bedrock and the overlying sand & gravel deposits were generally maintained at the TLs inside of the slurry wall throughout the quarter, with the exception of TL No. 2. The detailed analysis of the hydraulic conditions at each transect in the various hydrogeologic units is provided below.

3.1 Assessment of Hydraulic Conditions in the Refuse Unit

Hydrographs 1 through 5 located in Appendix A show the continuous water levels in the refuse wells at TL Nos. 1 through 5. The heavier weight line denotes wells located outside the slurry wall. A straight line on the hydrograph signifies that the water levels were below the range on the Trol. The hydrographs show that intragradients conditions (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at TL Nos. 3, 4, and 5 throughout the quarter. A detailed analysis of each of the TL is provided below.

TL No. 1 (Well 1G/Well 2G)

Intragradients conditions were not observed throughout the quarter. The average quarterly water elevation for Well 1G (inside) and Well 2G (outside) was 13.82 and 12.63 feet msl, respectively. High water levels in Well 1G have been observed on several previous occasions and may be related to localized conditions around the well.

Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 2, and indicate that the leachate collection system is

functioning properly. The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in Well 1G do not indicate this condition.

In an effort to further investigate the high water levels seen in Well 1G, approximately 1 well volume of groundwater was removed from the well (seen as a vertical drop in water levels on the Hydrograph) on September 5, 2001. The groundwater level in Well 1G dropped over 2 feet, and only recovered approximately 0.25 feet over the remainder of the month. The reason for the limited recovery of water levels in Well 1G is unknown at this point.

TL No. 2 (Well 3G/Well 4G)

Intragradiant conditions were not consistently observed throughout the quarter. Intragradiant conditions were observed from approximately July 1, 2001 until July 29, 2001, and again from August 14, 2001 until September 9, 2001. The average quarterly water elevation for Well 3G (inside) and Well 4G (outside) was 10.63 and 10.80 feet msl, respectively. The quarterly averages were within 0.2 feet; however, there appears to be a small inward gradient.

TL No. 3 (Well 5G/Well 6G)

Based on the Troll data collected, intragradiant conditions were maintained at TL No. 3 in the refuse unit throughout the quarter. The average quarterly water elevation for Wells 5G (inside) and 6G (outside) was 10.75 and 12.66 feet msl, respectively. The head elevation difference between the two wells was approximately 1.9 feet in an inward direction.

TL No. 4 Well 15G/Well 13G) Oil Seeps Area

The automatic data recorder for Well 13G, outside the wall malfunctioned, and a new miniTroll was installed into the well during the site visit of September 5, 2001. The automatic data recorder for Well 15G, inside the wall also malfunctioned. Data in Well 15G was collected until August 14, 2001. The October manual water elevations for Wells 13G and 15G was 6.52 and 1.41 feet msl, respectively. These readings suggest significant intragradiant conditions are being maintained at this location.

TL No. 5 (Well 9G/Well 10G)

Intragradiant conditions were maintained at TL No. 5 in the refuse unit throughout the quarter. The average quarterly water elevation for Wells 9G (inside) and 10G (outside) was 7.96 and 8.87 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.91 feet in an inward direction.

3.2 Assessment of Hydraulic Conditions in the Sand & Gravel Unit

Hydrographs 6 through 9 located in Appendix A, show the continuous water levels in the sand & gravel wells at TL Nos. 2 through 4. The water levels in the wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrographs 6 through 9 show the average water level in the well over a 24-hour period (12 hours before and 12 hours after). The heavier weight line on the hydrograph denotes wells located outside the slurry wall.

TL No. 2 (Well 3S/Well 4S)

Intragradient conditions were evident throughout the quarter, although there were periods where such conditions were not maintained. The average quarterly water elevation for Wells 3S (inside) and 4S (outside) was 1.32 and 1.37 feet msl, respectively.

TL No. 3 (Well 5S/Well 6S)

Intragradient conditions were maintained at TL No. 3 in the sand & gravel unit throughout the quarter. The average quarterly water elevation for Wells 5S (inside) and 6S (outside) was 1.46 and 1.80 feet msl, respectively. The head elevation difference between the two wells was approximately 0.34 feet in an inward direction.

TL No. 4 (Well 7S/Well 8S)

Intragradient conditions were maintained at TL No. 4 in the sand & gravel unit throughout the quarter. The average quarterly water elevation for Wells 7S (inside) and 8S (outside) was 1.70 and 2.47 feet msl, respectively. The head elevation difference between the two wells was approximately 0.77 feet in an inward direction.

TL No. 4 (Well 15S/Well 13S) Oil Seeps Area

Due to an upward gradient between the sand & gravel and refuse units in the oil seeps area, groundwater was not collected from the sand & gravel unit. Hydrograph 9 shows the ambient conditions between Wells 15S (outside) and 13S (inside) in the sand & gravel unit.

3.3 Assessment of Vertical Hydraulic Gradients

Hydrographs 10 through 15 located in Appendix A, show the continuous water levels in the sand & gravel and bedrock wells at TL Nos. 2 through 4. The water levels in the bedrock wells vary significantly over the course of the day due to the tidal influence at the site. For clarity, the hydrographs show the average water level in the well over a

24-hour period (12 hours before and 12 hours after). The heavier weight line on the hydrograph denotes wells located in the bedrock unit.

On average, upward gradient conditions between the bedrock and the overlying sand & gravel deposits were often observed at all of the TLs throughout the quarter, with the exception of TL No. 2 inside and outside of the slurry wall, and TL No. 3 on the outside of the slurry wall. A detailed analysis of each of the TLs is provided below.

TL No. 2 (Well 3S/Well 3RR) – Inside; (Well 4S/Well 4R) - Outside

Upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 2 throughout the quarter. The average quarterly water elevation for both Well 3S (sand & gravel) and 3RR (bedrock) was 1.32 feet msl.

Outside the slurry wall at TL No. 2, the vertical gradient between the bedrock and overlying sand & gravel units was in a downward direction. The average quarterly water elevation for Wells 4S (sand & gravel) and 4R (bedrock) was 1.37 and 1.10 feet msl, respectively.

TL No. 3 (Well 5S/Well 5R) – Inside; (Well 6S/Well 6R) - Outside

Upward gradient conditions were maintained between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 3 throughout the quarter. The average quarterly water elevation for Wells 5S (sand & gravel) and 5R (bedrock) was 1.46 and 1.64 feet msl, respectively.

Outside the slurry wall at TL No. 3, upward gradient conditions were not observed between the bedrock and overlying sand & gravel units. The average quarterly water elevation for Wells 6S (sand & gravel) and 6R (bedrock) was 1.80 and 1.76 feet msl, respectively.

TL No. 4 (Well 7S/Well 7R) – Inside; (Well 8S/Well 8RR) - Outside

Upward gradient conditions were maintained between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 4 throughout the quarter. The average quarterly water elevation for Wells 7S (sand & gravel) and 7R (bedrock) was 1.70 and 2.60 feet msl, respectively.

Outside the slurry wall at TL No. 4, upward gradient conditions were observed between the bedrock and overlying sand & gravel units. The average quarterly water elevation for Wells 8S (sand & gravel) and 8RR (bedrock) was 2.47 and 2.64 feet msl, respectively.

Hydrograph 9 also contains the continuous water level elevations for Well 15G in the refuse unit. Upward gradient conditions were maintained across the meadow mat

between the sand & gravel and refuse units in the Oil Seeps Area throughout the quarter. Due to the Troll malfunctioning in Well 15G, manual water levels were used for comparison. The average quarterly manual water elevation for Wells 15S (sand & gravel unit) and 15G (refuse unit) was 2.38 and 0.86 feet msl, respectively. The average head elevation difference between the two wells was approximately 1.52 feet in an upward direction.

3.4 OU2 Hydraulic Monitoring

The synoptic groundwater elevations obtained during the Third Quarter of 2001 indicate both upward and downward hydraulic gradients.

Downward hydraulic gradients prevail between the refuse and the underlying sand & gravel. Downward hydraulic gradients were only noted between the overlying sand & gravel and bedrock units at WE-3S/WE-3R on July 5 and September 5; WE-5S/WE-5R on August 14; GEI-6S/WE-6R on July 5, August 14, and September 5, and WE-7S/WE-7R on August 14.

4 LEACHATE WITHDRAWAL/GROUNDWATER PUMPING

The performance of the site hydraulic controls is largely dependent upon groundwater pumping and leachate withdrawal rates. The design aqueous leachate and groundwater (GW) collection rates called for a ratio of 3:1, groundwater to leachate of 30,000 gpd groundwater, and 10,000 gpd leachate. The collection rates differed from the design rates due to variations between design assumptions and actual site conditions. Collection rates are also adjusted based on changing site and operational conditions.

A groundwater pumping well performance evaluation was conducted in January and February of 2000 to evaluate the performance of the groundwater collection system in the sand and gravel. According to the Groundwater Pumping Well Performance Evaluation Report, prepared by IT Corporation in September 2000, hydraulic control of OU1 can be achieved by pumping S&G-2 and S&G-3 at a combined rate ranging from 10,000 to 15,000 gpd, with S&G-2 pumped at twice the flow rate of S&G-3. Based on the above recommendation, S&G-2 should be pumped at 10,000 gpd and S&G-3 pumped at 5,000 gpd. The long-term extraction rates could be reduced over time to 10,000 gpd or even lower based on the hydraulic monitoring data.

Leachate collection rates should maintain a leachate level low enough to achieve intragradiant conditions and high enough to allow for the collection of oil. Based on the operational history, a leachate collection rate of 1,500 gpd is recommended to maintain intragradiant conditions.

Operation records are maintained at the site and contain estimated daily averages for leachate and groundwater withdrawal. The monthly volumes collected and the daily average collection rate are provided below:

Monitoring Period	Groundwater S&G #1	Groundwater S&G #2	Groundwater S&G #3	Groundwater S&G #4	Leachate
July	25,800 gal.	391,759 gal.	88,366 gal.	8,618 gal.	39,980 gal.
	832 gpd	12,637 gpd	2,851 gpd	287 gpd	1,193 gpd
August	1,485 gal.	318,237 gal.	214,854 gal.	432 gal.	33,906 gal.
	48 gpd	10,266 gpd	6,931 gpd	14 gpd	1,094 gpd
September	0 gal.	242,520 gal.	160,415 gal.	0 gal.	39,369 gal.
	0 gpd	8,084 gpd	5,347 gpd	0 gpd	1,312 gpd
Quarter	27,285 gal.	952,516 gal.	463,635 gal.	9,050 gal.	113,255 gal.
	297 gpd	10,353 gpd	5,040 gpd	98 gpd	1,231 gpd

The volume of groundwater collected in the third quarter is 1,452,486 gallons. The average daily groundwater withdrawal rate for the third quarter is 15,788 gpd. During the quarter, the average daily withdrawal rate from S&G No. 2 met the recommended extraction rate of 10,000 gpd for the months of July and August, but was below the recommended rate for the month of September. The average daily withdrawal rate from S&G No. 3 met the recommended extraction rate of 5,000 gpd for the months of August and September, but was below the recommended rate for the month of July. The leachate collection rate of 1,231 gpd does not meet the recommended rate of 1,500 gpd.

5 LANDFILL GAS MIGRATION MONITORING

Landfill gas migration monitoring was performed at the operational flare port inlet and the 6 gas migration monitoring wells located along the northern edge of the landfill boundary.

5.1 Landfill Gas Migration

The purpose of the gas migration monitoring program is to monitor for off-site gas migration in those areas where gas migration or accumulation could lead to explosive conditions. Six gas migration monitoring wells are located outside of the circumferential slurry wall along the northern edge of the landfill boundary. The well locations are depicted on Drawing 1 and are spaced in 200-foot increments.

All areas of OU1 exterior to the slurry wall contain waste materials except along the northern edge of the landfill boundary. High levels of gas are not expected to be detected along the northern boundary because the slurry wall will act as an effective barrier, and the presence of an active gas extraction system and the high water table will inhibit gas migration.

Gas monitoring in other areas of the site containing waste materials will likely reveal combustible gas. However, since no on-site OU1 buildings are present (except the leachate treatment facility, which has its own engineered gas monitoring and control system), gas migration monitoring in the waste areas is not required by the O&M manual.

5.2 Gas Monitoring Well Results

Measurements of percent combustible gas (% GAS) and percent lower explosive limit (% LEL) were performed in the 6 gas migration monitoring wells along the northern boundary of the site on July 5, 2001. The wells were monitored in accordance with Attachment 1, Section 3.0 - Routine Operations and Maintenance of the Kin-Buc Landfill Draft O&M Manual (Wheelabrator, 1995). A Landtec GEM 500 sampling device was used to measure the concentration of combustible gas at each well by attaching the meter's sample tubing to the well head petcock and drawing the sample through the meter. Detectable levels of percent combustible gas and percent lower explosive limit

were not observed in any gas monitoring wells. The results of the 6 gas migration monitoring wells are shown in Table 5-1.

5.3 Operational Flare Monitoring Results

The percent combustible gas by volume (% methane) at the landfill's operational flare port inlet was recorded throughout the third quarter of 2001. All readings were collected with a Landtec GEM 500 Gas Analyzer, equipped with a charcoal filter. Monitoring performed on July 5, 2001, revealed combustible gas at 39.1 percent at the flare port inlet.

The following summarizes the flare station operation during the Third Quarter of 2001:

Date	Gas Flow (SCFM)	Methane % by volume
7/2/01	92	49.1
7/15/01	96	56.4
7/30/01	103	58.1
8/17/01	117	54.1
8/27/01	122	41.7
9/10/01	148	41.3
9/24/01	140	41.5
Averages for Third Quarter	117	48.9

Note: Flare station data provided by Landfill personal.

6 CONCLUSIONS

Significant conclusions for the Third Quarter of 2001 monitoring program are as follows:

- In the refuse unit, intragradient conditions were maintained over the entire quarter at Transects 3, 4, and 5. An average daily leachate extraction rate of 1,231 gpd was collected.
- Intragradient conditions were not observed for the entire quarter in the refuse unit at Transect 2.
- Intragradient conditions were not indicated by the monitoring wells in the refuse unit at Transect 1, although there is evidence that intragradient conditions may be present at this location.
- In the sand and gravel, intragradient conditions were maintained at TL Nos. 3 and 4 over the entire quarter, although at TL No. 2 there were periods where intragradient conditions were not maintained. However, the average of water levels over the quarter was intragradient.
- An upward gradient across the meadow mat (between the sand & gravel and refuse units) was imposed at TL No. 4 in the Oil Seeps Area by leachate collection; therefore, intragradient conditions do not need to be maintained in the sand & gravel unit.
- Upward hydraulic gradients were observed at TL No. 3 inside the slurry wall and at TL No. 4 both inside and outside the slurry wall. At TL No. 2 inside the slurry wall and at TL No. 3 outside the slurry wall, there were intermittent periods where upward gradient conditions were not observed. At TL No. 2 outside the slurry wall, upward conditions were not observed.
- The volume and rate of groundwater collection was consistent with recommended levels. However, to optimize the hydraulic performance, S&G-2 should be pumped at twice the flow rate of S&G-3.
- Combustible gas as a percent of total gas and the lower explosive limit was not detected in the 6 monitoring wells located on the northern boundary of the site. The flare was operational and the percent methane at the flare port inlet was

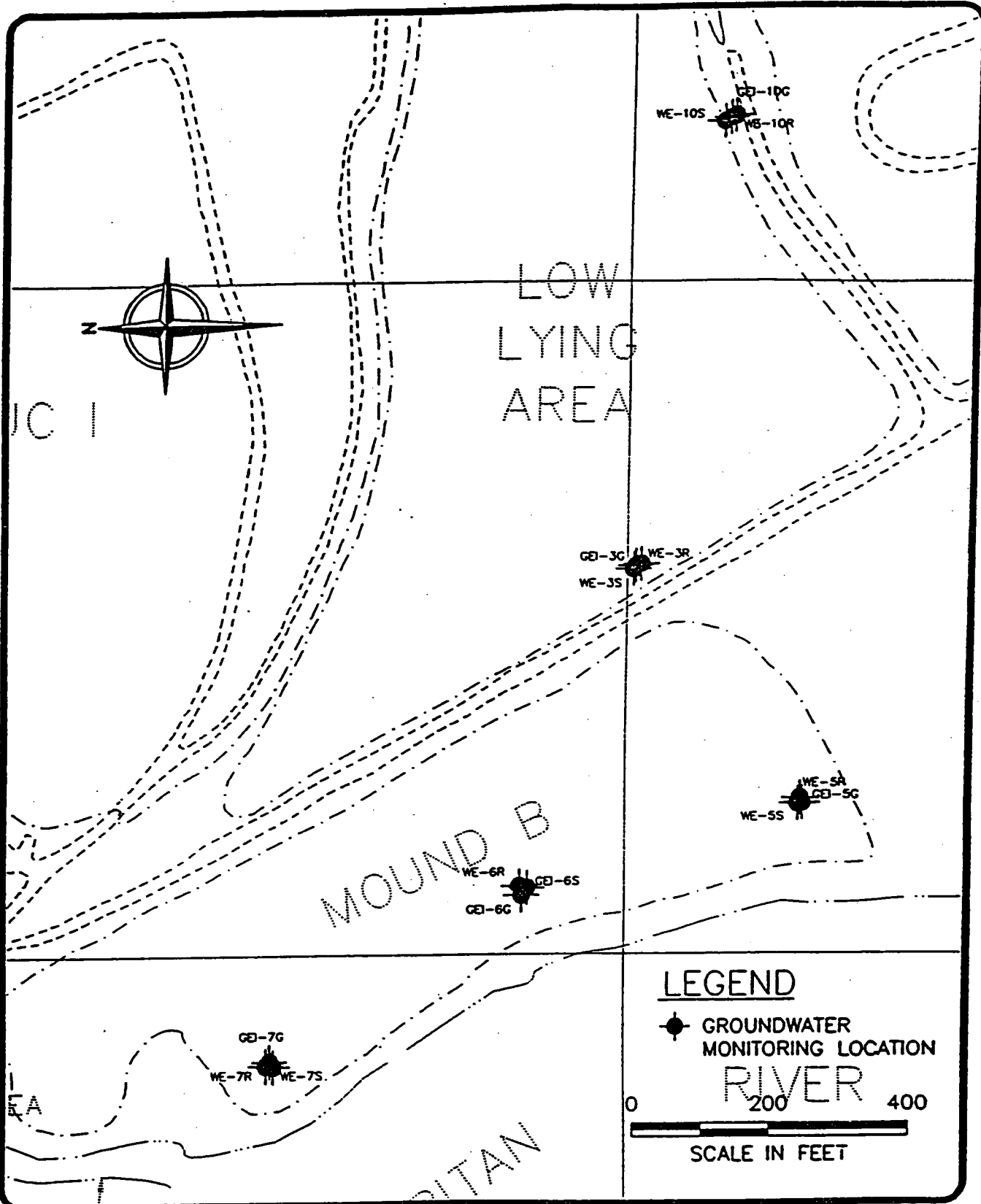
39.1 percent. Based on the non-detection of combustible gas in the monitoring wells, the active gas collection system is functioning properly and there is no off-site gas migration.

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- Proposed Groundwater Monitoring Plan for the Kin-Buc Landfill Operable Unit 1 RD/RA, Wehran Engineering Corporation, Middletown, New York, December 1992.
- Final Addendum 1 to the Proposed Groundwater Monitoring Plan for the Kin-Buc Landfill Operable Unit 1 Closure Plan Re: OU2 Groundwater and Surface Water Monitoring, Wehran Engineering Corporation, Middletown, New York, August 1994.
- Draft Operations and Maintenance Manual for the Kin-Buc Landfill, Wheelabrator EOS, Inc., Pittsburgh, PA, August 1995.
- Remedial Action Report for Operable Unit 2 for the Kin-Buc Landfill Superfund Site, Blasland, Bouck & Lee, Inc., January 1996.
- Appendix C Groundwater, Surface Water, Wetlands and Biota Monitoring Plans for the Kin-Buc Landfill Operable Units 1 and 2, Wheelabrator EOS, Inc., Pittsburgh, PA, August 1995.
- Remedial Action Report Volume I Remedial Action Report, Tables, Appendices A1-A5 for the Kin-Buc Landfill Operable Unit 1, Blasland, Bouck & Lee, Inc., September 1995, Revised February 1996.
- Draft Remedial Investigation Report for Kin-Buc Landfill Operable Unit 2, Wehran Engineering Corporation, Middletown, New York, October 1990.
- Influent Equalization Logs, (Wheelabrator), Inc., Kin-Buc Landfill Treatment Plant, January 1997, February 1997, March 1997.
- Kin-Buc Landfill Leachate Treatment Plant Operation and Site Post-Closure Care, Monthly Reports, Wheelabrator EOS, April, May, June 1997.
- Groundwater Pumping Well Performance Evaluation Report, IT Corporation, July 2000.

Figure

ene-mtown2\data: F:\DWC\12568001\MAXBF-01.dwg Xrefs: 8X11P, MAXBWE01, MAXBTW01, MAXB8001
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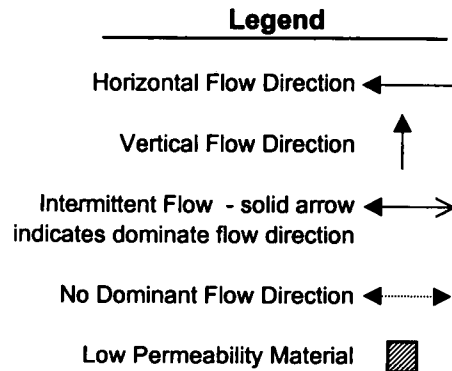
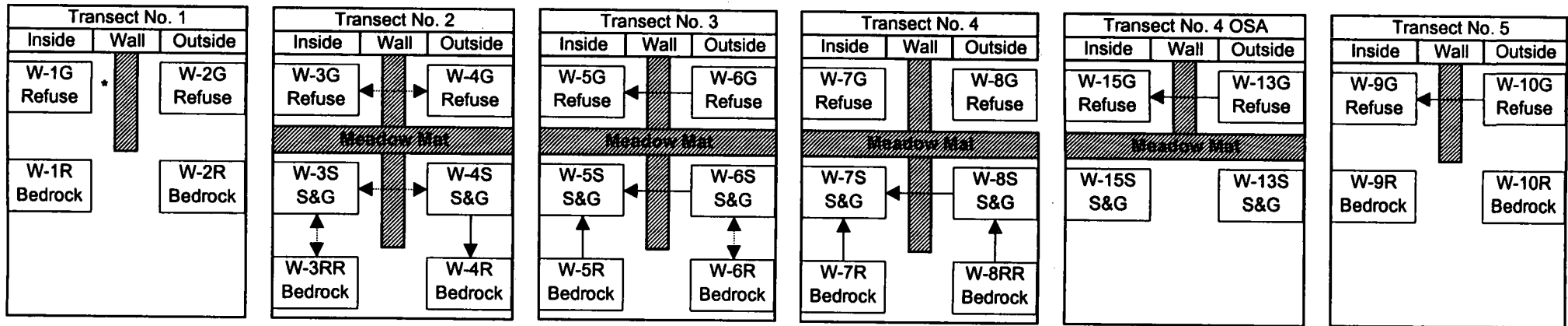


DATE	_____
DWN	DBT
APP	RB
REV	_____

KINBUC LANDFILL
 EDISON TOWNSHIP, NEW JERSEY
 OU2 GROUNDWATER
 MONITORING LOCATIONS

FIGURE
 1-1
 PROJECT NO.
 12568-001.000

Figure 3-1
Kin-Buc Landfill
Hydraulic Profile Summary
Third Quarter 2001



NOTE: * The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

Drawing

TABLES

Table 2-1

**Kin-Buc Landfill
Operable Unit 1
Continuous Hydraulic Monitoring Well Network/Transects**

Transect Location No.	Screened Hydrogeologic Unit	Well Location Inside Slurry Wall	Well Location Outside Slurry Wall
1	Refuse/Fill	W-1G	W-2G
2	Refuse/Fill	W-3G	W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill	W-5G	W-6G
	Sand and Gravel	W-5S	W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill ⁽¹⁾	W-15G	W-13G
	Sand and Gravel ⁽¹⁾	W-15S	W-13S
	Sand and Gravel ⁽²⁾	W-7S	W-8S
	Bedrock ⁽²⁾	W-7R	W-8RR
5	Refuse/Fill	W-9G	W-10G

Notes: ⁽¹⁾ Wells located across the extended slurry wall.
⁽²⁾ Wells located across the OU1 circumferential slurry wall.

Table 2-2

**Kin-Buc Landfill
Operable Unit 2
Hydraulic Monitoring Network**

Well Location	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-10G	Fill/Refuse
WE-10S	Sand & Gravel
WE-10R	Bedrock
GEI-3G	Fill/Refuse
WE-3S	Sand & Gravel
WE-3R	Bedrock
Mound B	
GEI-5G	Fill/Refuse
WE-5S	Sand & Gravel
WE-5R	Bedrock
GEI-6G	Fill/Refuse
GEI-6S	Sand & Gravel
WE-6R	Bedrock
GEI-7G	Fill/Refuse
WE-7S	Sand & Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock

Table 2-3
KinBuc Landfill Operable Units 1 and 2
Modified Monitoring Program
Third Quarter 2001
Manually Recorded Water Level Elevations

Well ID	TOC Bottom	TOC Ref Elevation	July 5, 2001		August 14, 2001		September 5, 2001	
			TOC Static	Elevation	TOC Static	Elevation	TOC Static	Elevation
OU1								
W-1G	20.50	30.78	17.93	12.85	16.28	14.50	16.43	14.35
W-1R	35.34	30.79	19.42	11.37	19.60	11.19	19.76	11.03
W-2G	20.83	30.77	18.10	12.67	18.64	12.13	18.97	11.80
W-2R	35.33	30.64	22.99	7.65	23.05	7.59	23.24	7.40
W-3G (oil)	19.07	20.73	10.08	10.65	10.29	10.44	10.56	10.17
W-3G	19.07	20.73	10.63	10.10	10.84	9.89	11.10	9.63
W-3S	31.48	20.79	18.92	1.87	19.83	0.96	19.28	1.51
W-3RR	54.40	21.16	19.77	1.39	20.55	0.61	19.77	1.39
W-4G	17.57	20.23	8.94	11.29	9.61	10.62	9.51	10.72
W-4S	31.58	19.71	18.02	1.69	19.14	0.57	18.11	1.60
W-4R	54.92	20.61	19.02	1.59	20.13	0.48	18.90	1.71
W-5G	24.36	23.94	12.99	10.95	13.11	10.83	13.21	10.73
W-5S	30.33	24.33	22.20	2.13	23.00	1.33	22.65	1.68
W-5R	41.64	24.11	22.01	2.10	22.85	1.26	22.50	1.61
W-6G	23.99	23.69	10.54	13.15	11.00	12.69	11.37	12.32
W-6S	38.49	24.00	21.73	2.27	22.57	1.43	22.20	1.80
W-6R	50.43	23.99	21.70	2.29	22.53	1.46	22.22	1.77
W-7G	19.91	18.30	7.32	10.98	7.55	10.75	7.63	10.67
W-7S	29.34	11.61	9.11	2.50	9.84	1.77	9.46	2.15
W-7R	45.13	11.05	8.42	2.63	9.15	1.90	8.78	2.27
W-8S	28.86	10.92	8.22	2.70	8.76	2.16	8.39	2.53
W-8RR	41.60	9.51	6.80	2.71	7.37	2.14	6.98	2.53
W-9G	21.93	27.34	19.48	7.86	19.56	7.78	19.50	7.84
W-9R	39.05	27.68	20.70	6.98	21.02	6.66	21.01	6.67
W-10G	22.56	27.43	18.63	8.80	18.81	8.62	18.72	8.71
W-10R	34.01	27.43	18.92	8.51	19.12	8.31	19.21	8.22
W-13S	29.32	10.1	7.57	2.53	8.14	1.96	7.83	2.27
W-13G	10.30	10.17	3.51	6.66	3.59	6.58	3.95	6.22
W-15S	33.36	16.05	13.38	2.67	14.00	2.05	13.64	2.41
W-15G ⁽¹⁾	16.99	16.18	15.35	0.83	15.35	0.83	15.26	0.92
OU2								
GEI-10G	13.91	13.65	0.79	12.86	0.83	12.82	1.75	11.90
WE-10S	29.57	14.99	12.91	2.08	13.46	1.53	13.23	1.76
WE-10R	41.74	13.96	11.91	2.05	11.92	2.04	12.20	1.76
GEI-3G	13.54	16.73	3.81	12.92	4.43	12.30	5.11	11.62
WE-3S	25.67	15.12	13.46	1.66	14.01	1.11	13.89	1.23
WE-3R	46.51	14.99	13.60	1.39	13.77	1.22	13.93	1.06
GEI-5G	14.60	16.08	9.15	6.93	9.37	6.71	9.49	6.59
WE-5S	25.84	15.04	13.89	1.15	13.31	1.73	13.85	1.19
WE-5R	49.64	15.31	14.11	1.20	13.75	1.56	14.15	1.16
GEI-6G	14.97	19.76	11.67	8.09	13.12	6.64	11.73	8.03
GEI-6S	43.67	20.99	20.31	0.68	18.53	2.46	20.40	0.59
WE-6R	47.12	19.62	19.22	0.40	17.52	2.10	19.25	0.37
GEI-7G	13.74	17.23	Dry	<3.49	Dry	<3.49	Dry	<3.49
WE-7S	30.07	15.86	15.45	0.41	13.51	2.35	15.47	0.39
WE-7R	72.88	15.93	14.53	1.40	15.01	0.92	14.55	1.38
WE-114DR	44.84	23.76	16.52	7.24	16.91	6.85	16.98	6.78

NOTE:

(1) All level, reference, bottom measurements recorded to the top of PVC inner casing.

n://proj/kinbuc/791186/quarterlyreports/2001/3rdqtr/Table 2-3qtlly water level tbl

Table 2-4
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2001 Minimum/Maximum Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	July	12.32	15.61	14.13	W-2G	July	12.64	13.66	13.22
	August	14.26	14.99	14.62		August	12.09	13.09	12.81
	September	11.91	14.44	12.68		September	11.51	12.75	11.83
	3rd Quarter	11.91	15.61	13.82		3rd Quarter	11.51	13.66	12.63
W-3G	July	10.47	10.92	10.70	W-4G	July	10.67	11.45	11.03
	August	10.45	10.84	10.64		August	10.59	10.99	10.74
	September	10.40	10.74	10.56		September	10.50	10.92	10.60
	3rd Quarter	10.40	10.92	10.63		3rd Quarter	10.50	11.45	10.80
W-3S	July	0.69	2.25	1.22	W-4S	July	0.27	2.63	1.29
	August	0.67	1.99	1.18		August	0.32	2.53	1.26
	September	1.02	2.18	1.58		September	0.58	2.94	1.58
	3rd Quarter	0.67	2.25	1.32		3rd Quarter	0.27	2.94	1.37
W-5G	July	10.34	11.19	10.73	W-6G	July	12.33	13.41	12.88
	August	10.32	11.07	10.82		August	12.27	12.99	12.63
	September	10.36	11.09	10.69		September	12.17	12.92	12.48
	3rd Quarter	10.32	11.19	10.75		3rd Quarter	12.17	13.41	12.66
W-5S	July	0.96	2.16	1.47	W-6S	July	1.29	2.45	1.80
	August	0.89	1.93	1.31		August	1.22	2.45	1.66
	September	1.13	2.13	1.60		September	1.46	2.44	1.93
	3rd Quarter	0.89	2.16	1.46		3rd Quarter	1.22	2.45	1.80
W-7S	July	1.30	2.27	1.69	W-8S	July	1.79	4.07	2.45
	August	1.20	2.05	1.58		August	1.84	4.17	2.42
	September	1.50	2.33	1.83		September	1.92	4.25	2.56
	3rd Quarter	1.20	2.33	1.70		3rd Quarter	1.79	4.25	2.47
W-15S	July	2.00	3.00	2.42	W-13S	July	1.79	3.14	2.29
	August	1.93	2.98	2.36		August	1.75	3.21	2.23
	September	2.15	3.28	2.56		September	1.91	3.40	2.40
	3rd Quarter	1.93	3.28	2.44		3rd Quarter	1.75	3.40	2.31
W-15G	July	0.74	0.87	0.81	W-13G	July 1-5	6.39	6.85	6.63
	August 1-14	0.79	0.87	0.82		August 14	NA	NA	6.58*
	September 5	NA	NA	0.92**		Sept. 5-30	6.13	6.63	6.35
	July-Aug.14	0.74	0.87	0.81		3rd Quarter	6.13	6.85	6.40
W-9G	July	7.66	8.25	7.93	W-10G	July	8.61	9.54	9.14
	August	7.62	8.20	7.95		August	8.35	9.04	8.69
	September	7.95	8.28	8.00		September	8.32	9.38	8.77
	3rd Quarter	7.62	8.28	7.96		3rd Quarter	8.32	9.54	8.87

Table 2-4
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2001 Minimum/Maximum Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-3RR	July	0.40	2.52	1.19	W-4R	July	-0.12	2.50	1.01
	August	0.44	2.33	1.18		August	-0.13	2.44	0.99
	September	0.78	2.60	1.59		September	0.22	2.76	1.32
	3rd Quarter	0.40	2.60	1.32		3rd Quarter	-0.13	2.76	1.10
W-5R	July	1.13	2.40	1.67	W-6R	July	1.27	2.42	1.77
	August	1.06	2.13	1.48		August	1.19	2.20	1.62
	September	1.29	2.35	1.79		September	1.45	2.38	1.89
	3rd Quarter	1.06	2.40	1.64		3rd Quarter	1.19	2.42	1.76
W-7R	July	1.76	2.70	2.14	W-8RR	July	1.96	4.22	2.61
	August	1.66	2.49	2.04		August	2.00	4.33	2.59
	September	2.00	2.87	2.32		September	2.09	4.42	2.72
	3rd Quarter	1.66	2.87	2.60		3rd Quarter	1.96	4.42	2.64

Note: * This elevation is calculated from a manual water level collected on August 14, 2001.

** This elevation is calculated from a manual water level collected on September 5, 2001.

Table 2-5
KinBuc Landfill Operable Unit 1
Third Quarter 2001
Troll Water Level Elevations vs. Manual Water Elevations

OU 1 Well ID	July			August			September			Average
	Troll	Manual	Difference	Troll	Manual	Difference	Troll	Manual	Difference	Difference
W-1G	12.71	12.85	-0.14	14.66	14.50	0.16	14.28	14.35	-0.07	-0.02
W-2G	12.62	12.67	-0.05	12.06	12.13	-0.07	11.88	11.80	0.08	-0.01
W-3G	10.72	10.65	0.07	10.55	10.44	0.11	10.46	10.17	0.29	0.16
W-3S	1.72	1.87	-0.15	0.91	0.96	-0.05	1.46	1.51	-0.05	-0.08
W-3RR	1.34	1.39	-0.05	0.85	0.61	0.24	1.41	1.39	0.02	0.07
W-4G	11.30	11.29	0.01	10.60	10.62	-0.02	10.71	10.72	-0.01	-0.01
W-4S	1.79	1.69	0.10	0.66	0.57	0.09	1.47	1.60	-0.13	0.02
W-4R	1.41	1.59	-0.18	0.39	0.48	-0.09	1.69	1.71	-0.02	-0.10
W-5G	10.99	10.95	0.04	10.89	10.83	0.06	10.48	10.73	-0.25	-0.05
W-5S	1.89	2.13	-0.24	1.10	1.33	-0.23	1.48	1.68	-0.20	-0.22
W-5R	2.07	2.10	-0.03	1.24	1.26	-0.02	1.64	1.61	0.03	-0.01
W-6S	2.24	2.27	-0.03	1.41	1.43	-0.02	1.79	1.80	-0.01	-0.02
W-6R	2.22	2.29	-0.07	1.39	1.46	-0.07	1.75	1.77	-0.02	-0.05
W-7S	2.20	2.50	-0.30	1.41	1.77	-0.36	1.80	2.15	-0.35	-0.34
W-7R	2.63	2.63	0.00	1.86	1.90	-0.04	2.24	2.27	-0.03	-0.02
W-8S	2.60	2.70	-0.10	2.09	2.16	-0.07	2.45	2.53	-0.08	-0.08
W-8RR	2.67	2.71	-0.04	2.25	2.14	0.11	2.53	2.53	0.00	0.02
W-9G	7.81	7.86	-0.05	7.69	7.78	-0.09	7.69	7.84	-0.15	-0.10
W-10G	9.06	8.80	0.26	8.45	8.62	-0.17	8.70	8.71	-0.01	0.03
W-13G	6.85	6.66	0.19	NA	6.58	NA	6.15	6.22	-0.07	0.06
W-13S	2.44	2.53	-0.09	1.98	1.96	0.02	2.21	2.27	-0.06	-0.04
W-15G	0.83	0.83	0.00	0.83	0.83	0.00	NA	0.92	NA	0.00
W-15S	2.71	2.67	0.04	2.13	2.05	0.08	2.39	2.41	-0.02	0.03

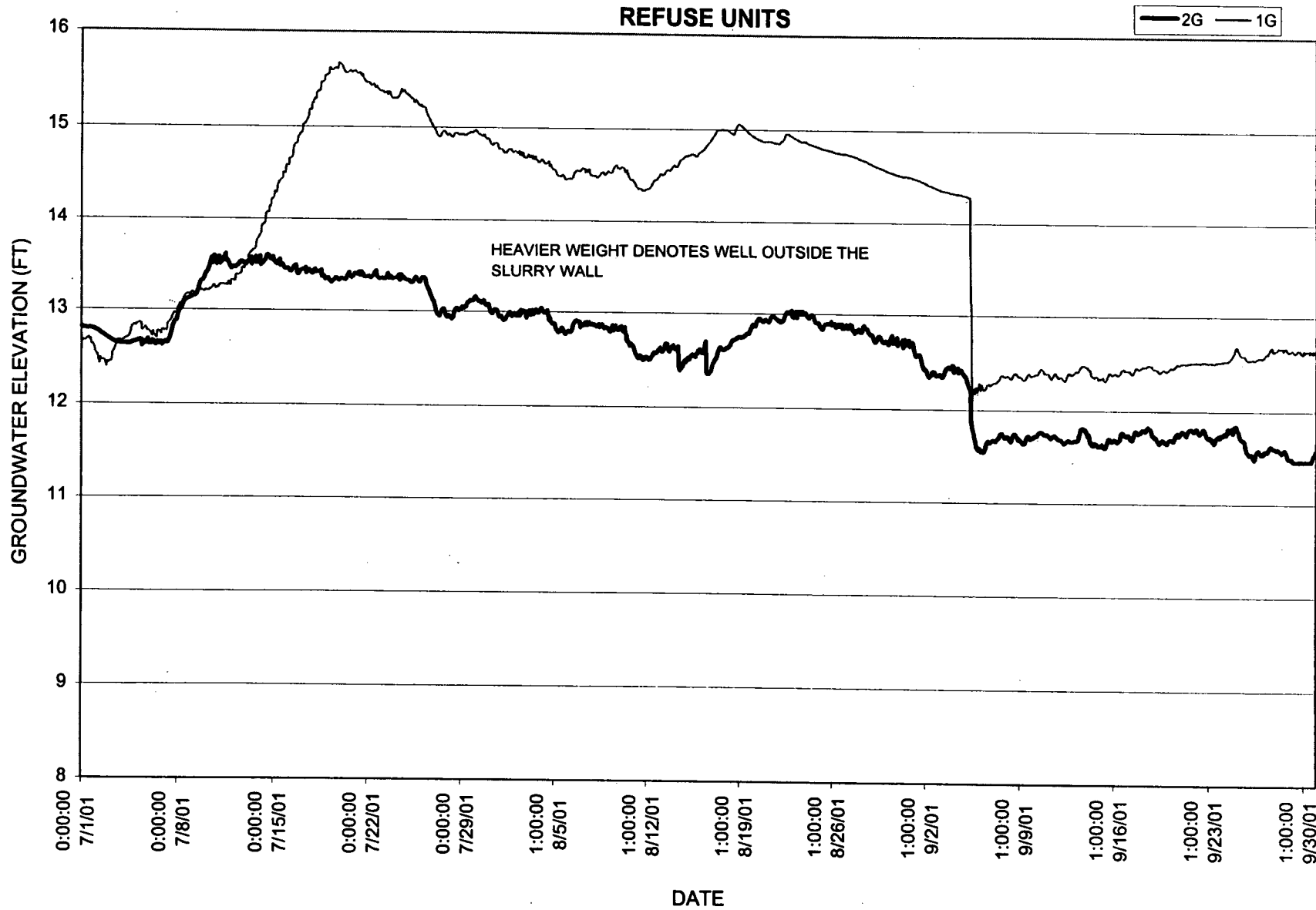
Table 5-1

**Kin-Buc Landfill
Operable Unit 1
Third Quarter 2001 Modified Program
Gas Monitoring Well Network/Results**

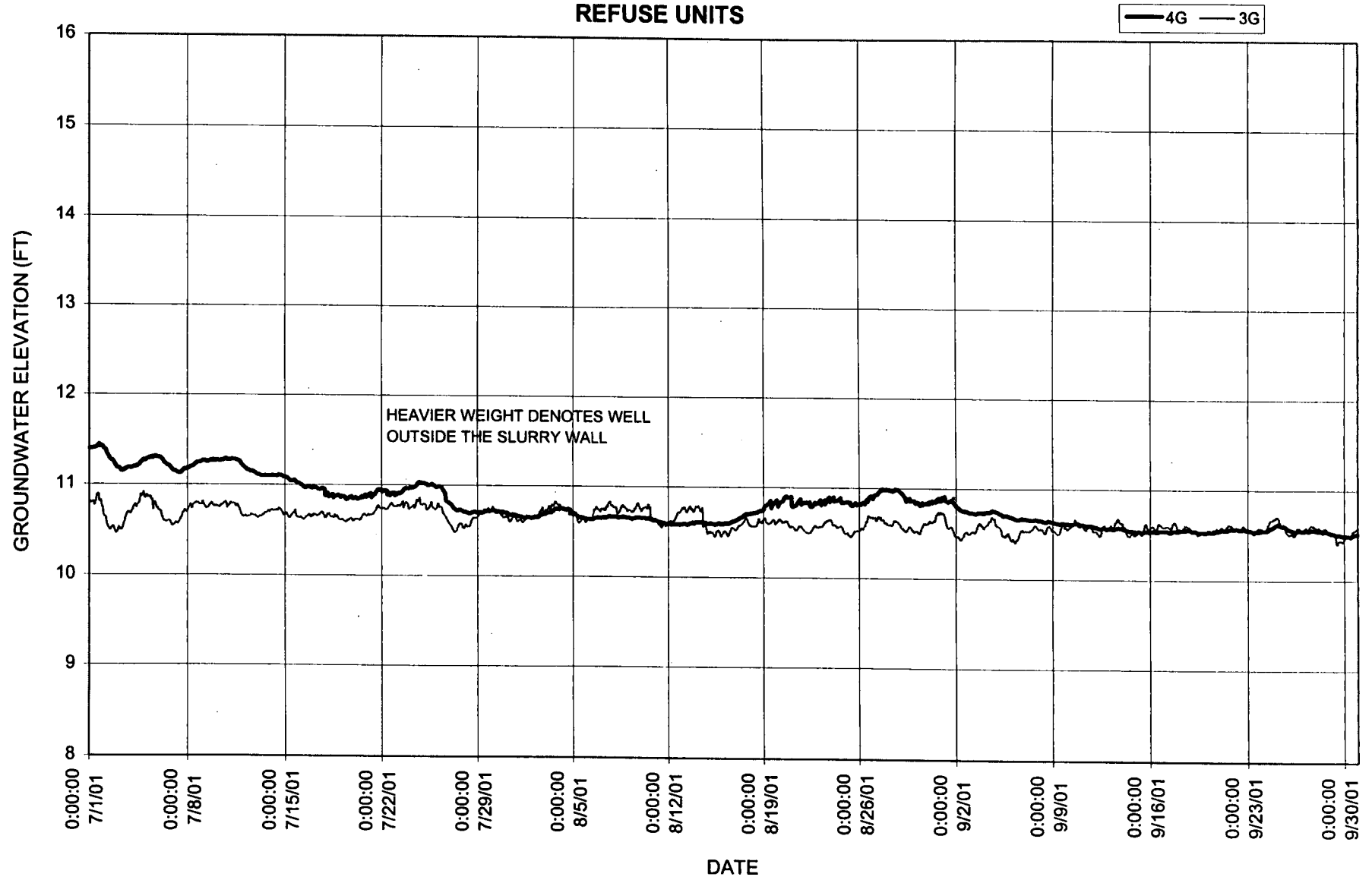
Well (Network) Location	Monitoring Result	
	% LEL	% GAS
GMW-01	0	0
GMW-02	0	0
GMW-03	0	0
GMW-04	0	0
GMW-05	0	0
GMW-06	0	0
Operational Flare Inlet	NA	39.1

APPENDIX A
CONTINUOUS WATER LEVEL MONITORING RESULTS

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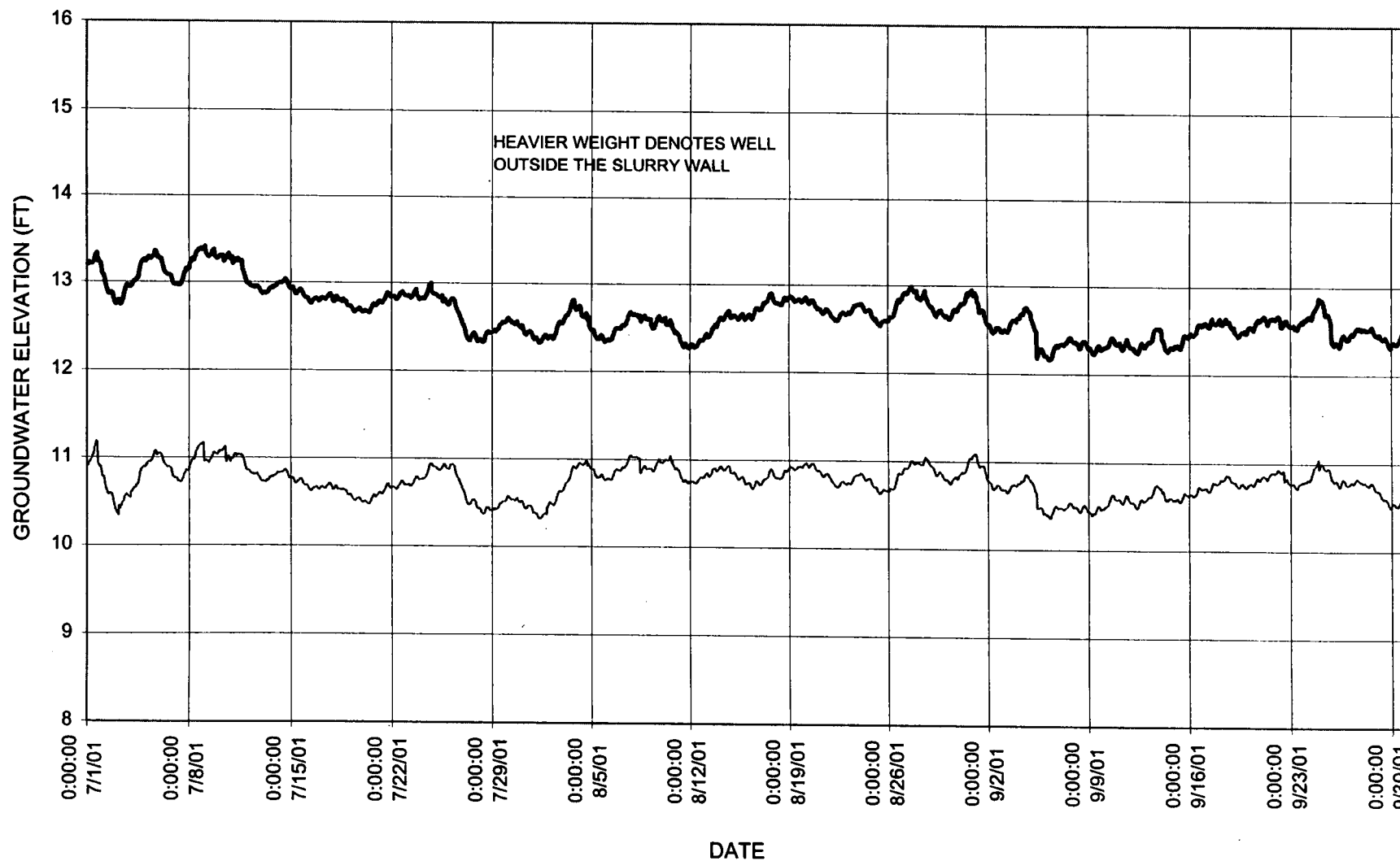


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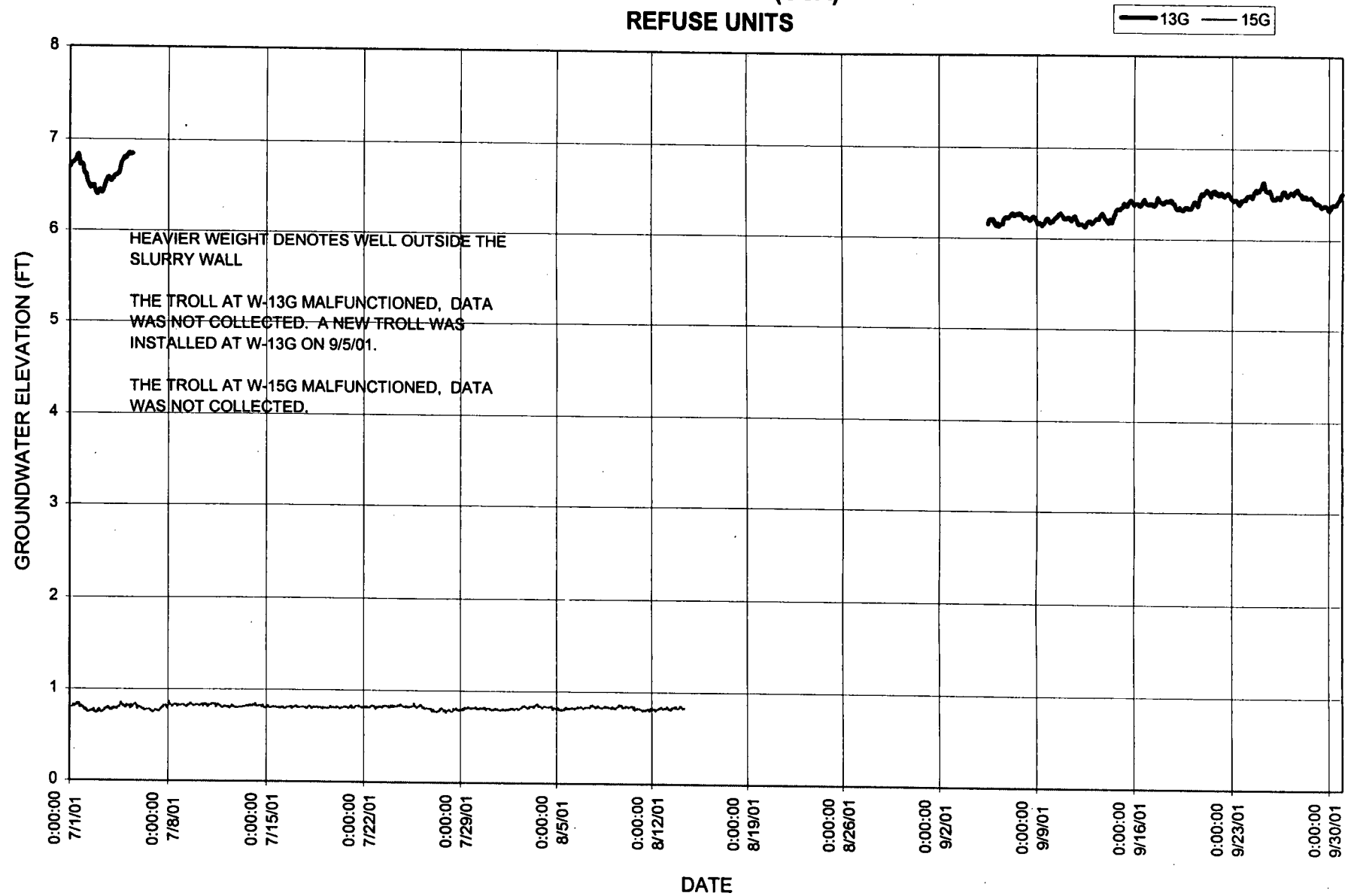


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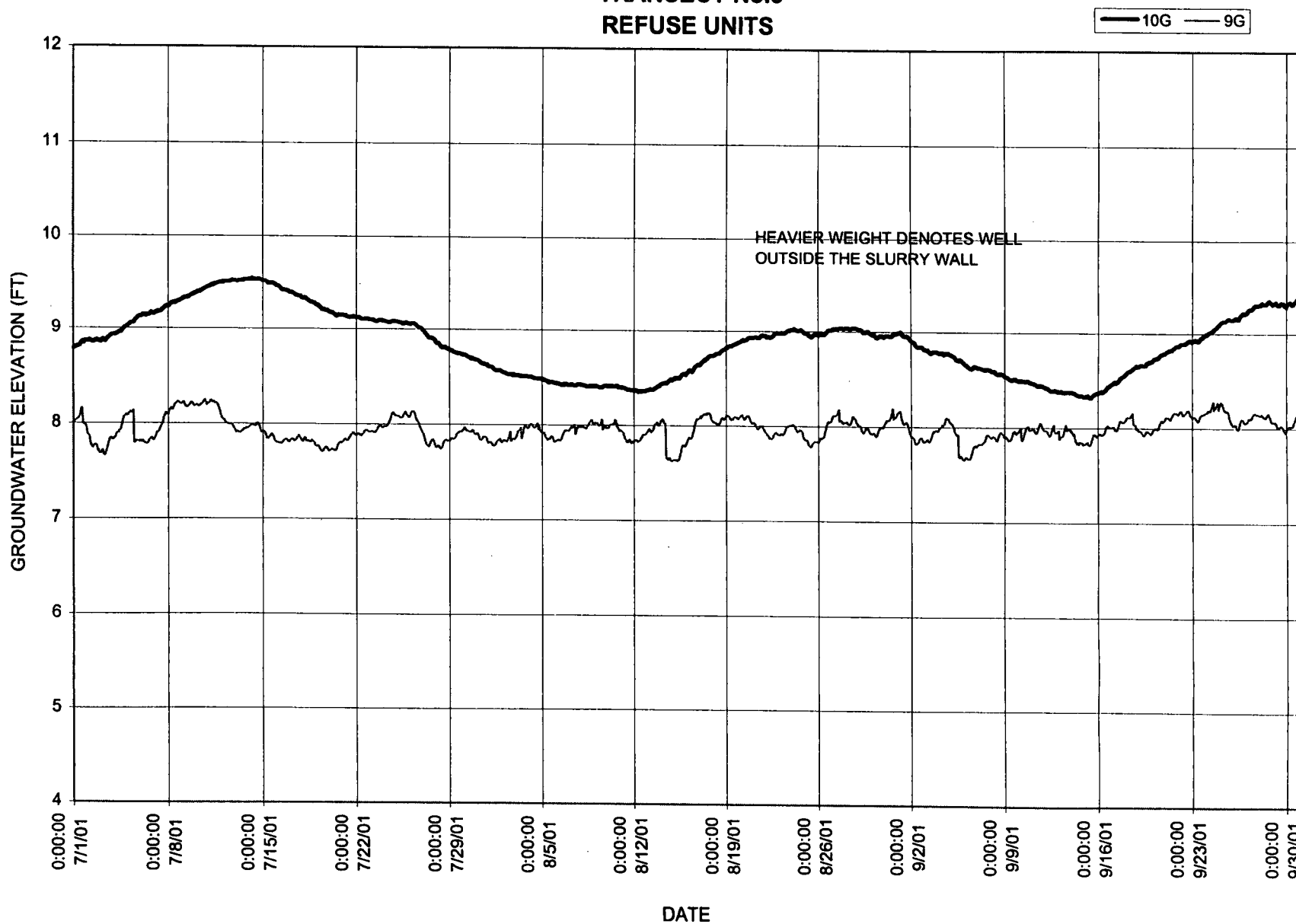
— 5G — 6G



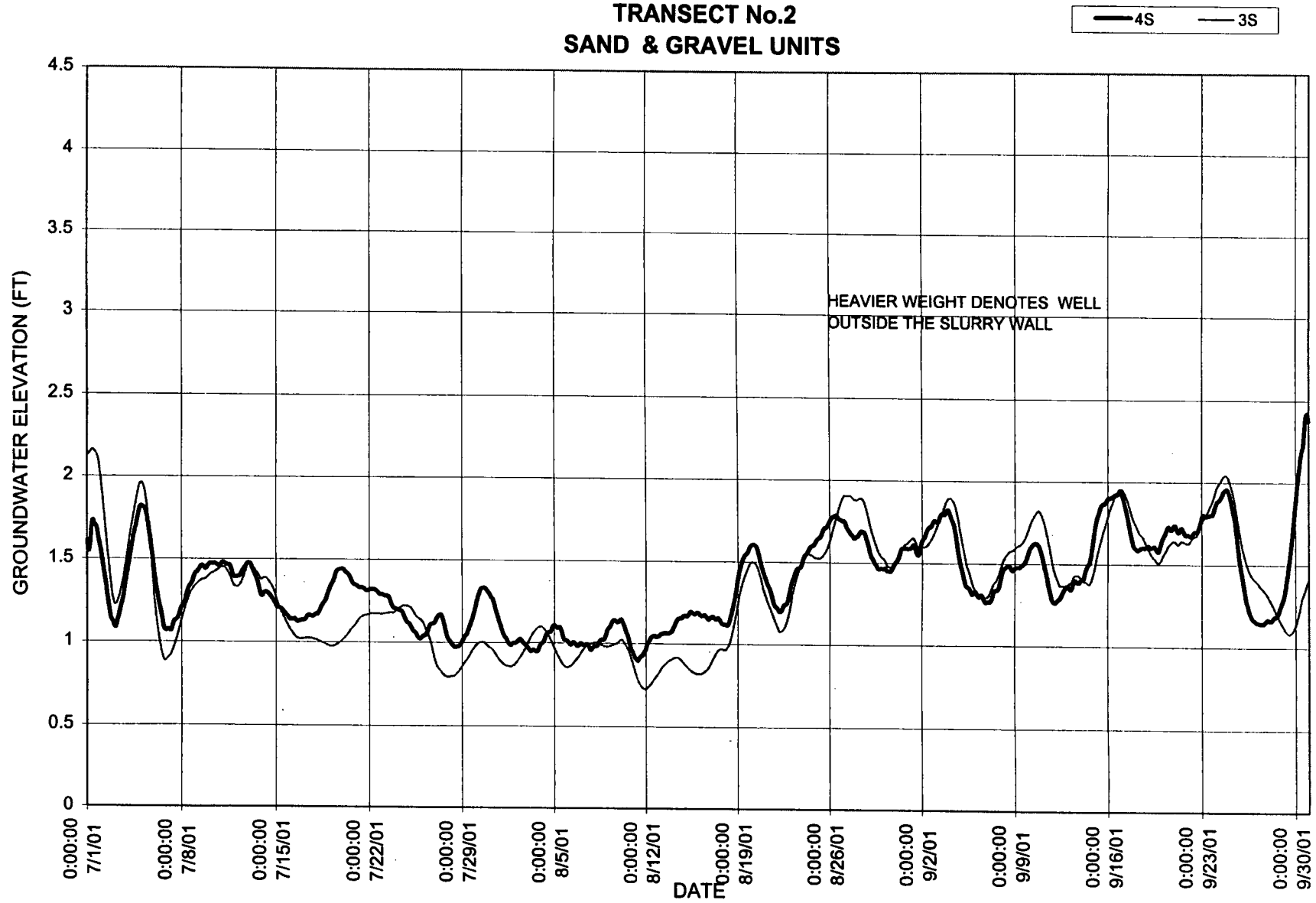
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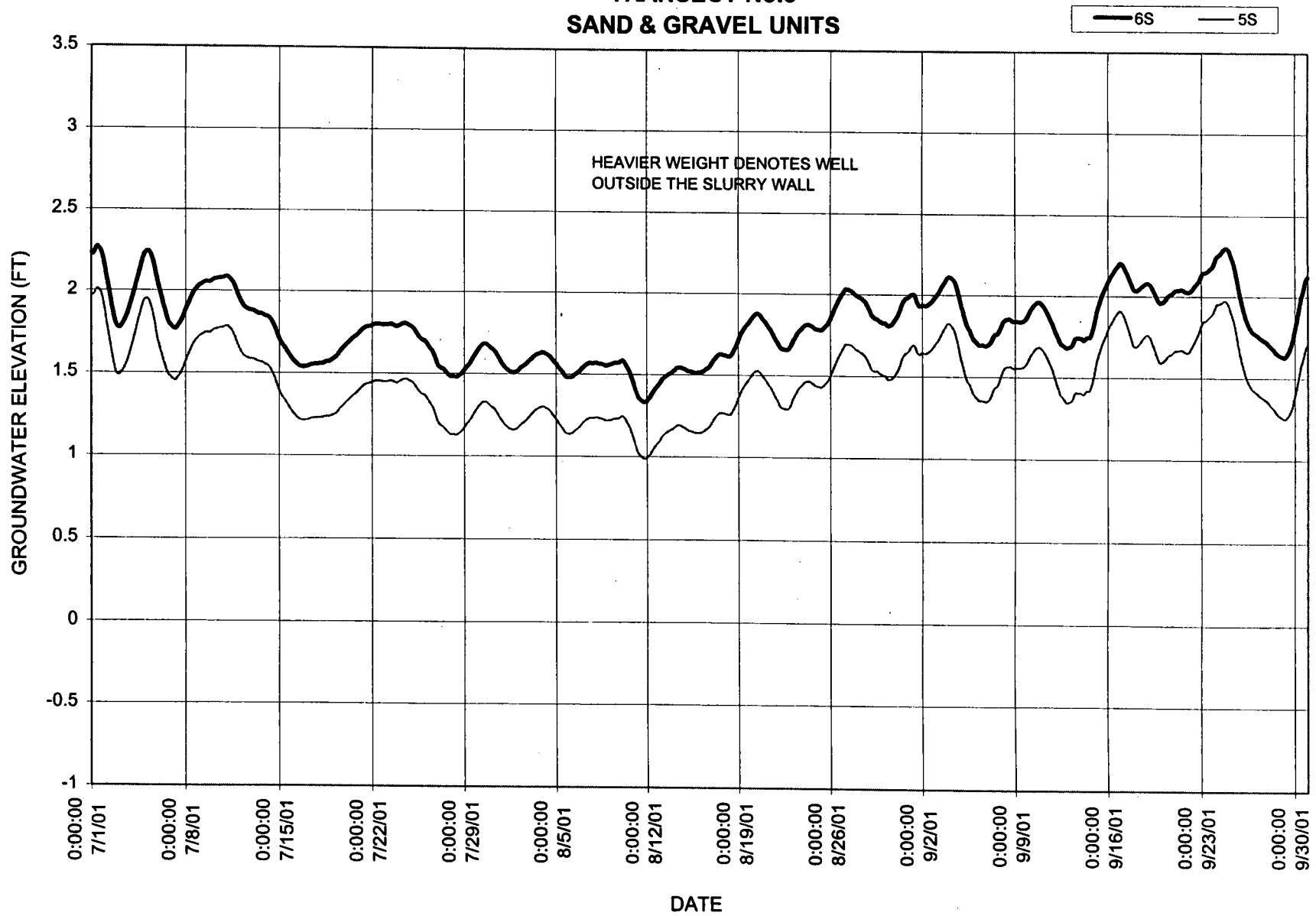
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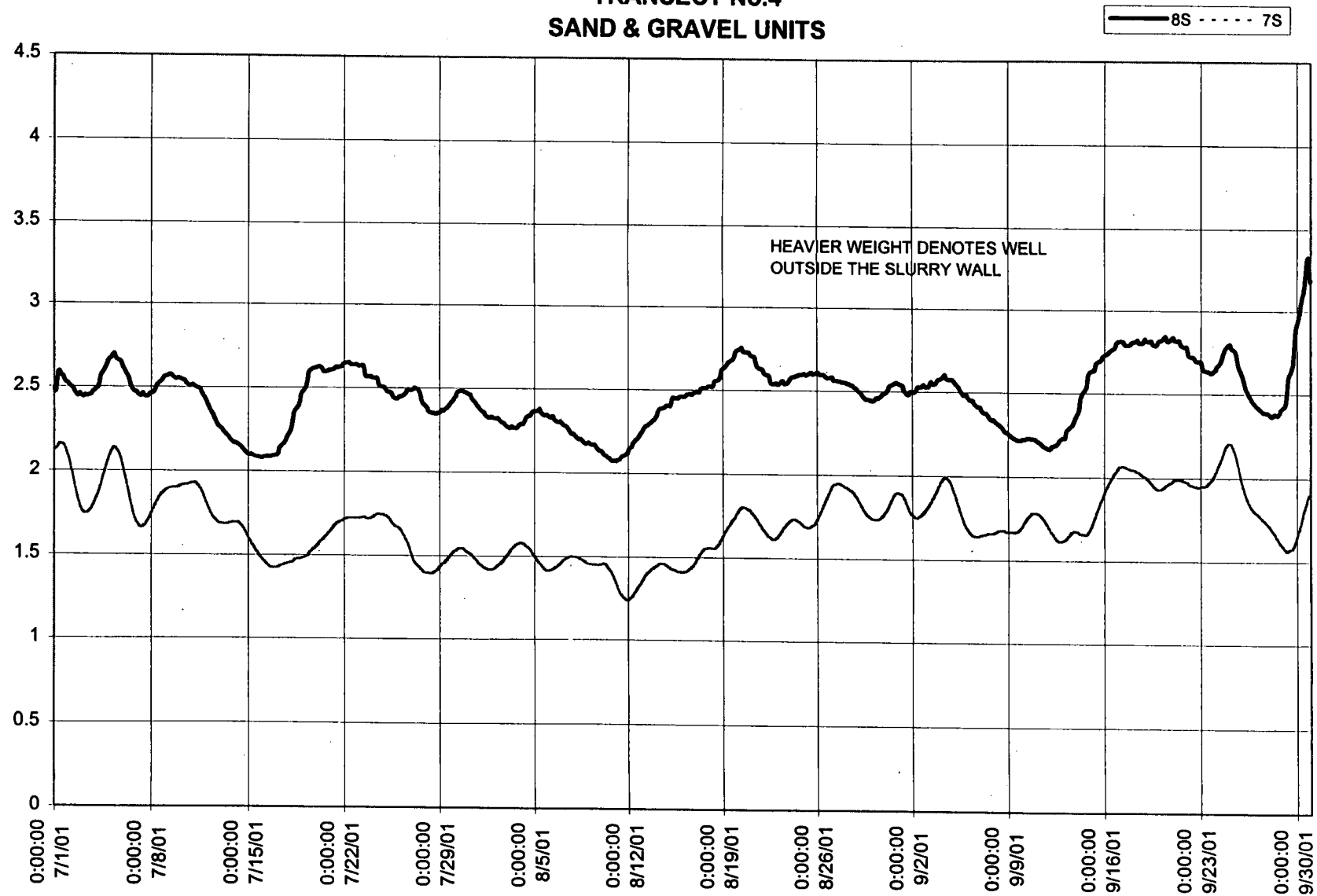
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SAND & GRAVEL UNITS



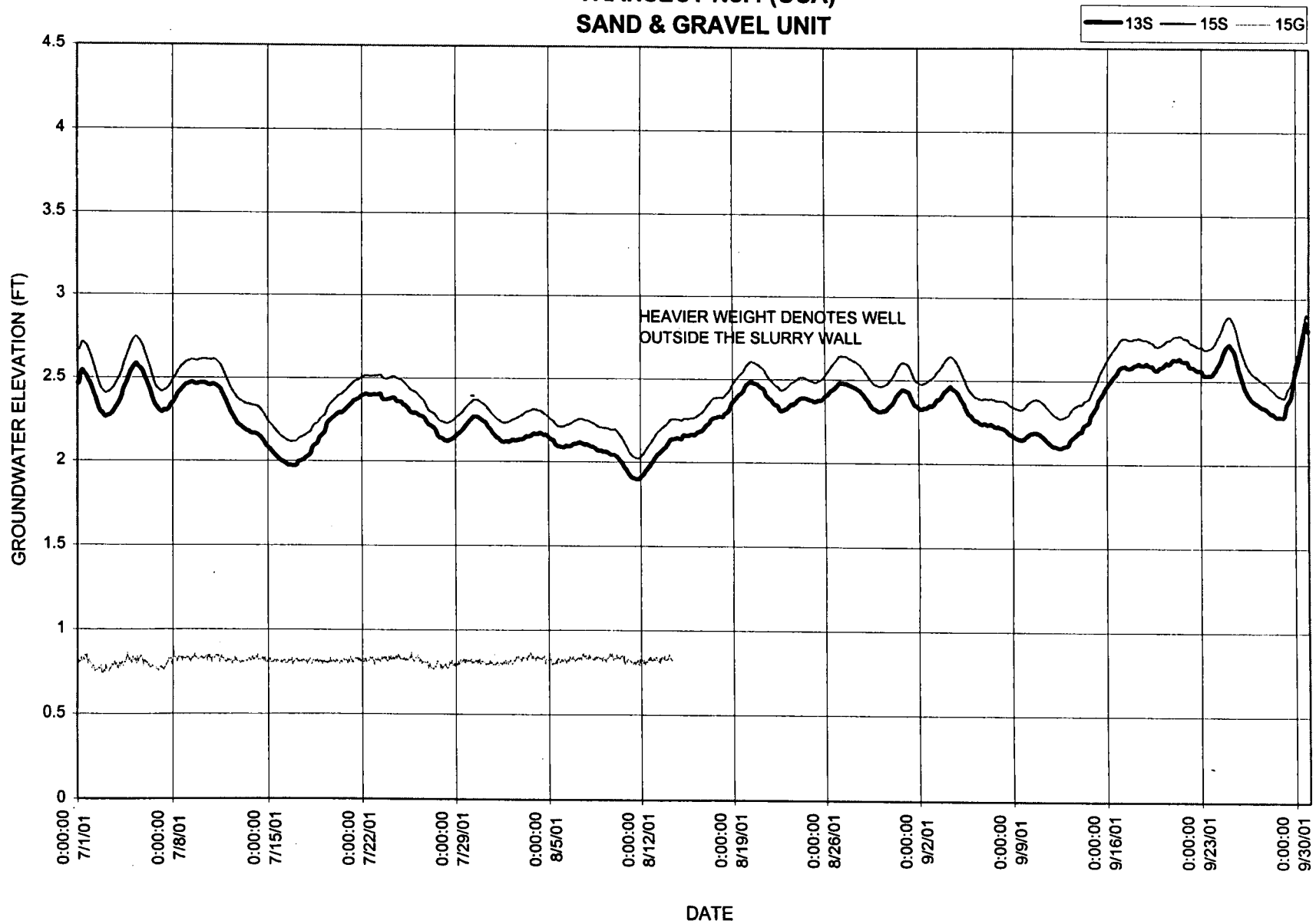
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SAND & GRAVEL UNITS



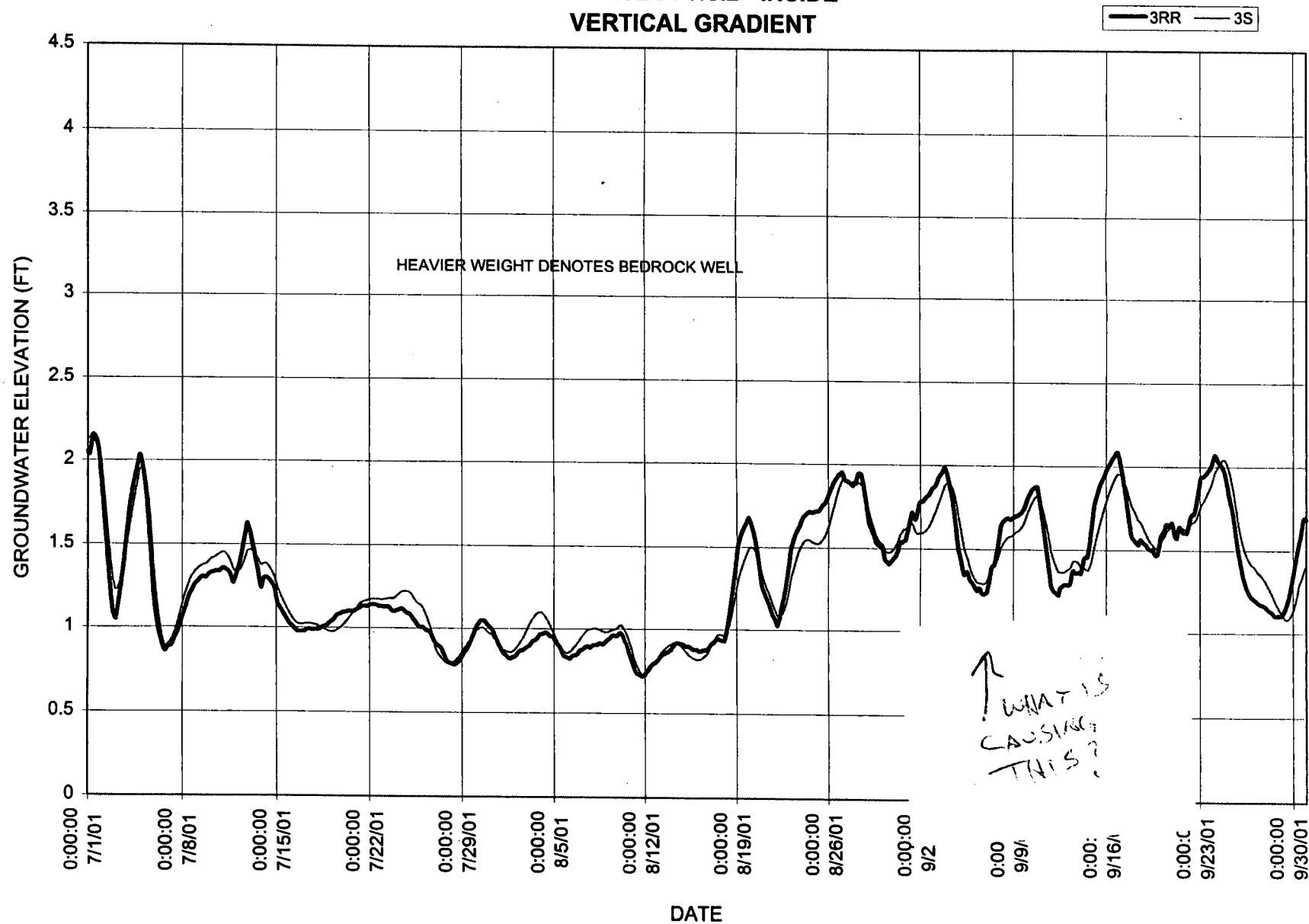
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
TRANSECT No.4
SAND & GRAVEL UNITS



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #9
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SAND & GRAVEL UNIT

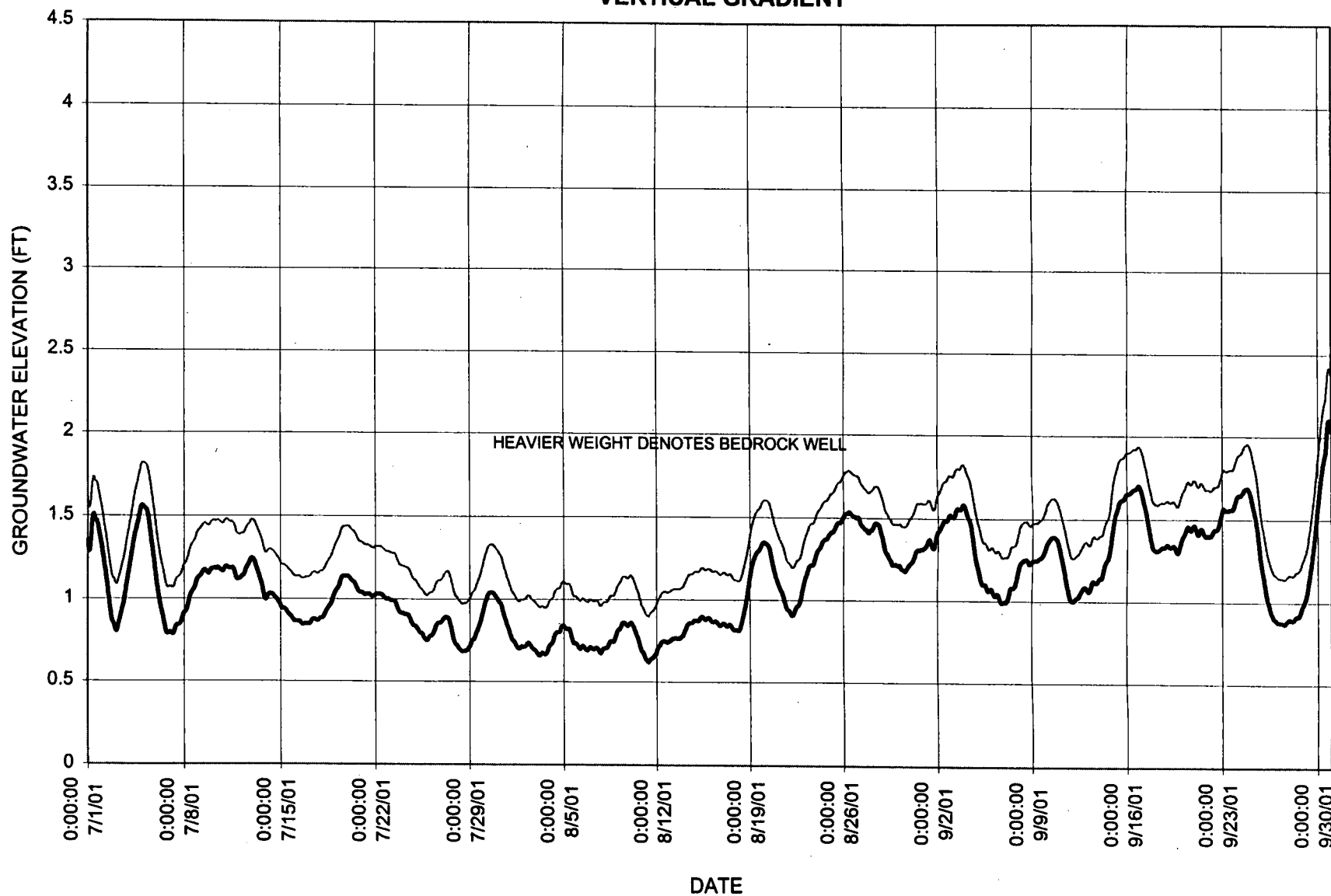


KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #10
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VERTICAL GRADIENT

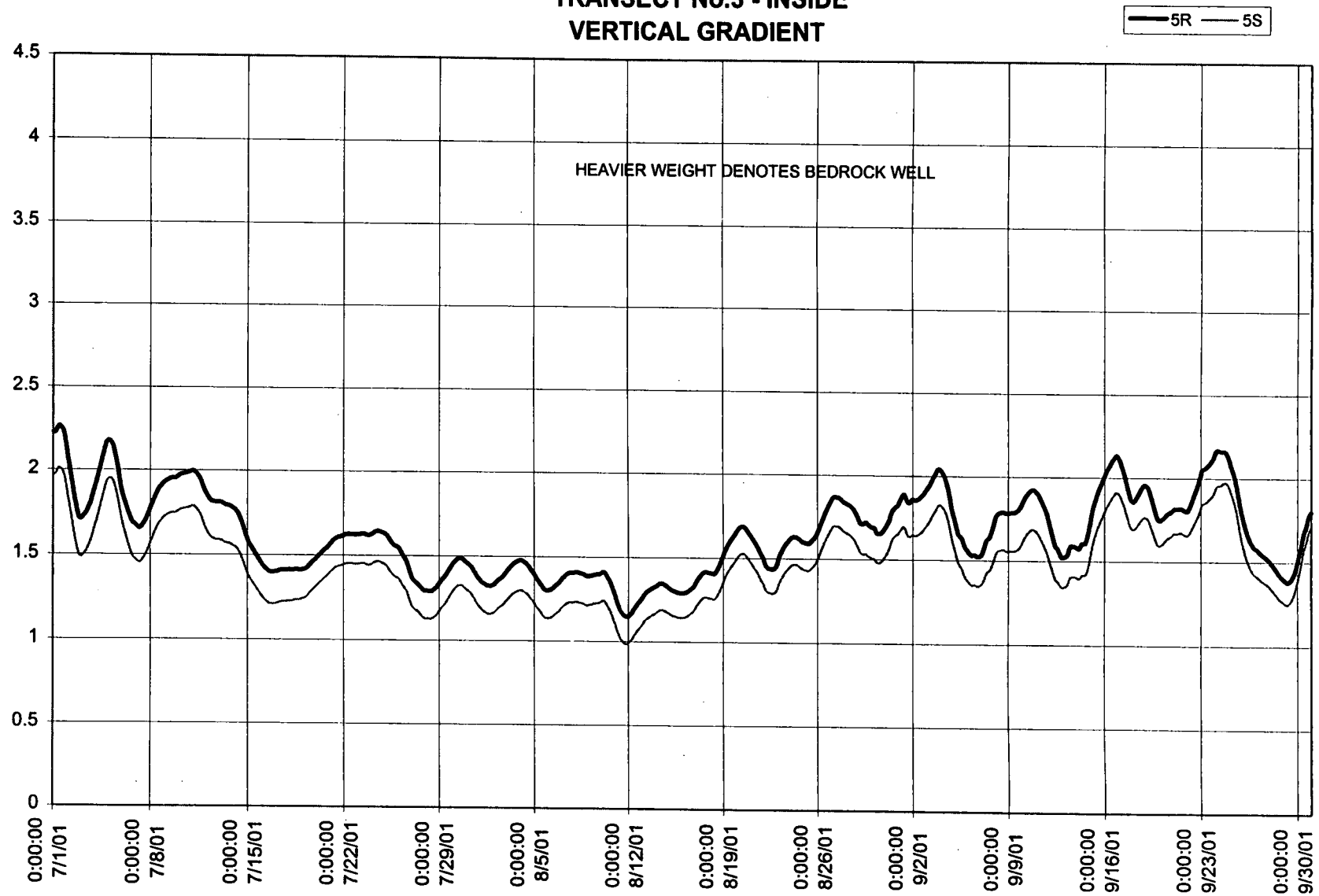


KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #11
TRANSECT No.2 - OUTSIDE
VERTICAL GRADIENT

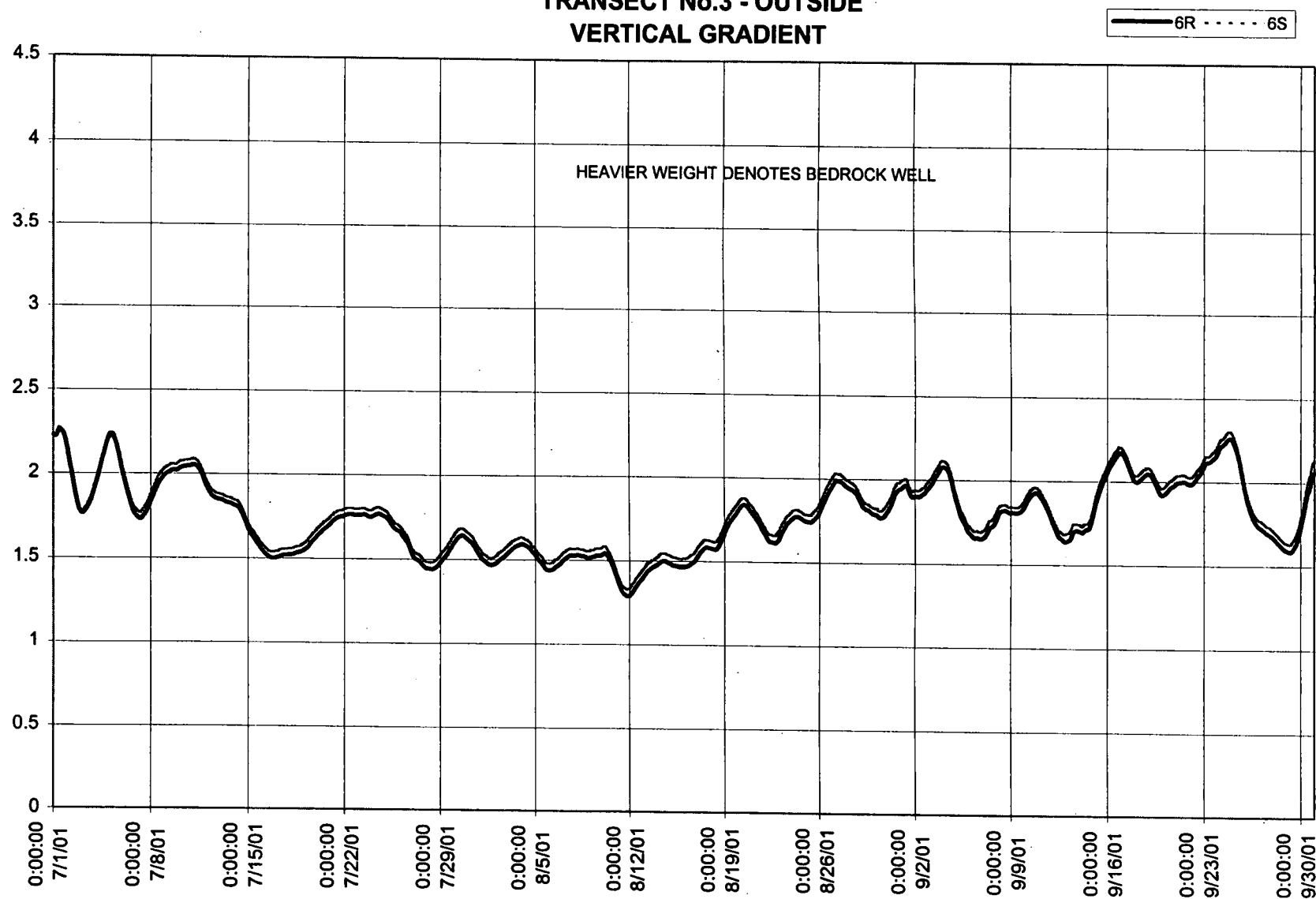
— 4R — 4S



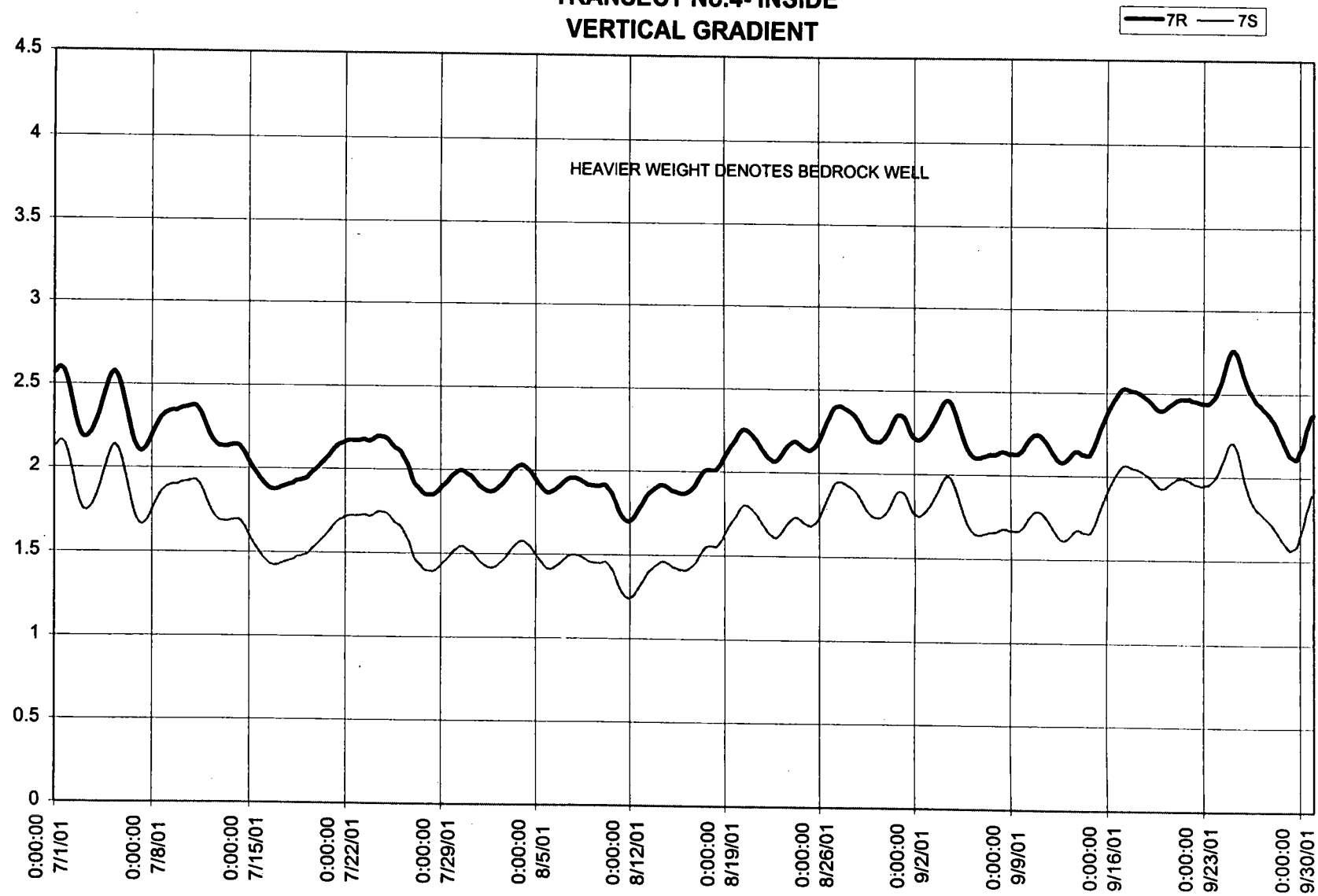
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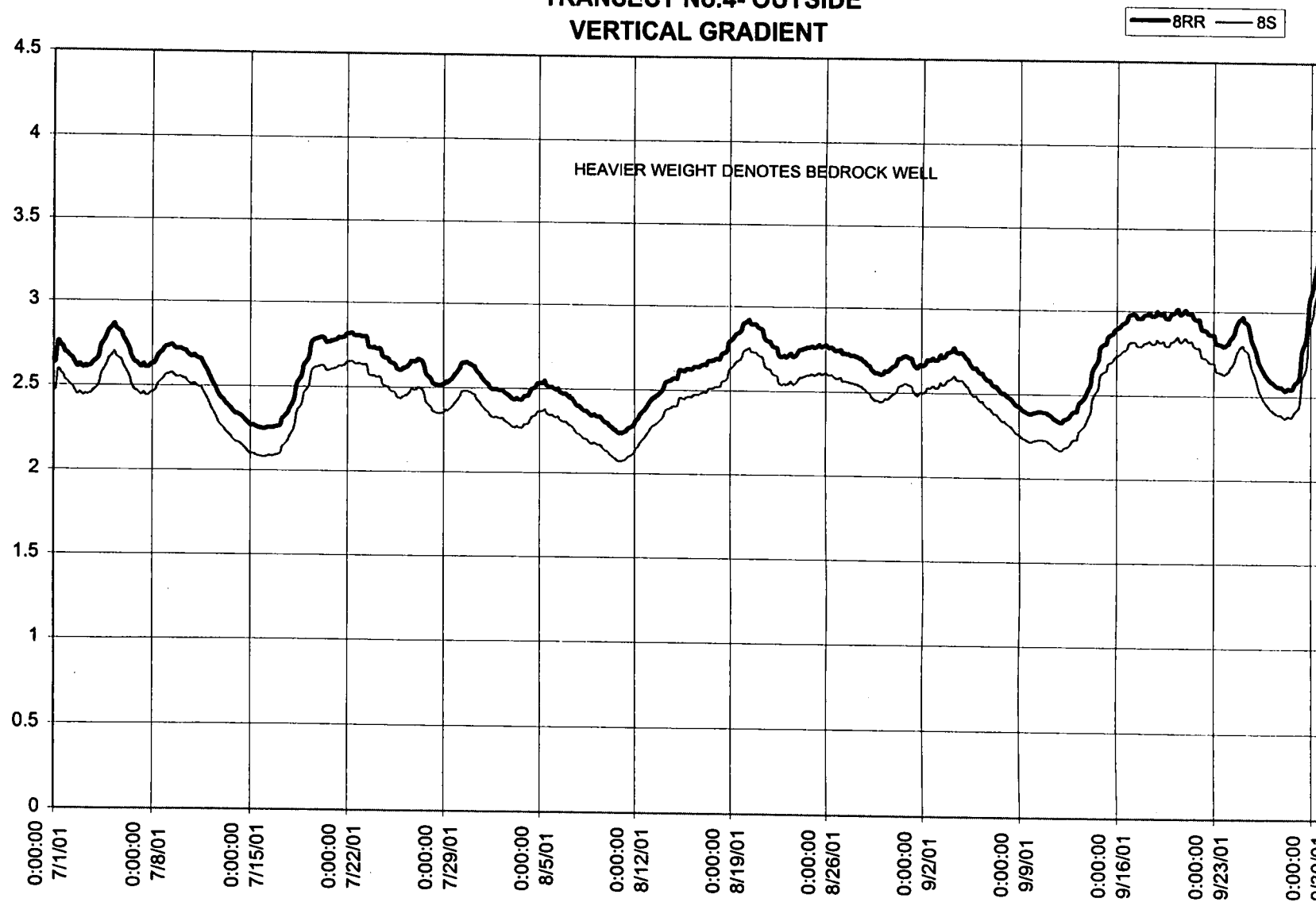
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #13
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #14
TRANSECT No.4- INSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
TRANSECT No.4- OUTSIDE
VERTICAL GRADIENT



APPENDIX B
MONTHLY HYDRAULIC EVALUATIONS



IT Corporation

Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
Tel. 201.512.5700
Fax. 201.512.5786

A Member of The IT Group

September 10, 2001

Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for July 2001

Dear Mr. Januszkiewicz:

A site visit was completed on August 14, 2001 to download water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of July 2001 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA in mid-November.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. The continuous water level elevation data was compared with manual readings indicating that the Trolls are functioning properly and are recording accurate data. Hydrographs have been prepared for each of the transect locations and are enclosed for your reference.

The water levels in wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 show the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Transect 1

Refuse (1G/2G)/Hydrograph No. 1 - Intragradiant conditions were not maintained throughout the month. Water levels in well W-1G increased by two feet over a period from July 10 to July 20, 2001. This pattern of increase in water levels has been observed on several previous occasions and may be related to localized conditions around the well. Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 2, and indicate that the leachate collection system is functioning properly. The fact that the leachate collection system is functioning properly suggests that intergradiant conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

Mr. Carl Januszkiewicz
September 10, 2001
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Transect 2

Refuse (3G/4G)/Hydrograph No. 2 - Intragradiant conditions were maintained throughout the month.

Sand and Gravel (3S/4S)/Hydrograph No. 6 - Intragradiant conditions were not consistently observed during the month. The average monthly water elevation for Well 3S (inside) and Well 4S (outside) was 1.22 and 1.29 feet msl, respectively. The monthly averages were within 0.2 feet, and therefore no dominant flow direction was evident for the month.

Vertical Gradient (3S/3RR)-Inside/Hydrograph No. 10 - Upward gradient conditions were not consistently maintained between the bedrock and overlying sand & gravel units inside the slurry wall. The average monthly water elevation for Well 3S (sand & gravel) and 3RR (bedrock) was 1.22 and 1.19 feet msl, respectively.

Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 - The vertical gradient between the bedrock and overlying sand & gravel units was in a downward direction throughout the month. The average monthly water elevation for Well 4S (sand & gravel) and 4R (bedrock) was 1.29 and 1.01 feet msl, respectively.

Transect 3

Refuse (5G/6G)/Hydrograph No. 3 - Intragradiant conditions were maintained throughout the month.

Sand and Gravel (5S/6S)/Hydrograph No. 7 - Intragradiant conditions were maintained throughout the month.

Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 - Upward gradient conditions were maintained between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month.

Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 - Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall. The difference in average monthly water elevations for Well 6S (sand & gravel) and 6R (bedrock) did not indicate a dominant flow direction.

Mr. Carl Januszkiewicz
September 10, 2001
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Transect 4

Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – The automatic data recorder for W-13G, outside the wall, malfunctioned. The unit was removed and a replacement device was ordered. A manual water level of 3.39 feet, collected on August 14, shows a trend towards intragradient conditions being maintained throughout the month. A new miniTroll was purchased to replace the existing data recorder in well W-13G, and was installed into the well during the site visit of September 5, 2001.

Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 - Due to an upward gradient between the sand & gravel and refuse units in the oil seeps area, groundwater was not collected from the sand & gravel unit. Hydrograph No. 9 shows the ambient conditions between Wells W-15S (outside) and W-13S (inside) in the sand & gravel unit. Water levels from Well W-15G in the refuse unit are included on the hydrograph for comparison.

Sand and Gravel (7S/8S)/Hydrograph No. 8 - Intragradient conditions were maintained throughout the month.

Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 - Upward gradient conditions were maintained between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month.

Vertical Gradient (8RR/8S)-Outside/Hydrograph #15 - Upward gradient conditions were maintained between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month.

Transect 5

Refuse (9G/10G)/Hydrograph #5 – Intragradient conditions were maintained throughout the month.

Figure 1 shows the hydraulic profile summary for July 2001.

Mr. Carl Januszkiewicz
September 10, 2001
Page 4

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Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from July 1 to July 31, 2001:

S&G #1 Groundwater	S&G #2 Groundwater	S&G #3 Groundwater	S&G #4 Groundwater	Leachate
25,800 gal.	391,759 gal.	88,366 gal.	8,618 gal.	39,986 gal.
832 gpd	12,637 gpd	2,851 gpd	287 gpd	1,193 gpd

For the period, a total of 514,543 gallons of groundwater was collected. The recommended rates are 10,000 gpd and 5,000 gpd from S&G Nos. 2 and 3, respectively. The average daily groundwater extraction rate for all of the wells of 16,607 gpd meets the recommended extraction rate of 15,000 gpd. The extraction rate of 2,851 gpd from S&G No. 3 was below the recommended extraction rate for this well.

The leachate extraction rate of 1,193 gpd meets the recommended rate of 1,000 gpd. Intragradiant conditions were maintained in the refuse unit at all of the transect locations throughout the month, except for Transect 1. Groundwater levels outside the slurry wall at Transect 2 appear to be dropping, therefore we recommend increasing the leachate collection rate to 1,500 gpd.

CONCLUSIONS

- Intragradiant conditions were maintained in the refuse unit at Transects 2 and 5. Intragradiant conditions were not observed in the refuse unit at Transect 1.
- Intragradiant conditions were maintained in the sand & gravel unit at Transects 3 and 4. Intragradiant conditions were not observed in the sand & gravel unit at Transect 2.
- Inside the slurry wall, upward gradient conditions were observed between the bedrock and overlying sand & gravel unit at Transects 3 and 4. Upward gradient conditions were not observed at Transect 2.

RECOMMENDATIONS

- Leachate collection rates should be maintained at 1,500 gpd.
- The collection rate for S&G No. 2 should be maintained at 10,000 gpd.

Mr. Carl Januszkiewicz
September 10, 2001
Page 5

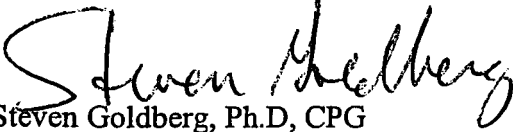
Project 791186


- The collection rate for S&G No. 3 should be increased to 5,000 gpd from the July average of 2,851 gpd.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

Sincerely,

IT CORPORATION


Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist


Thomas Connors, P.E.
Project Manager

Attachments

cc: Glenn Grieb, US Filter

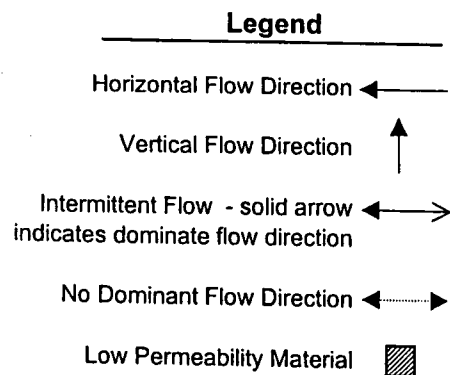
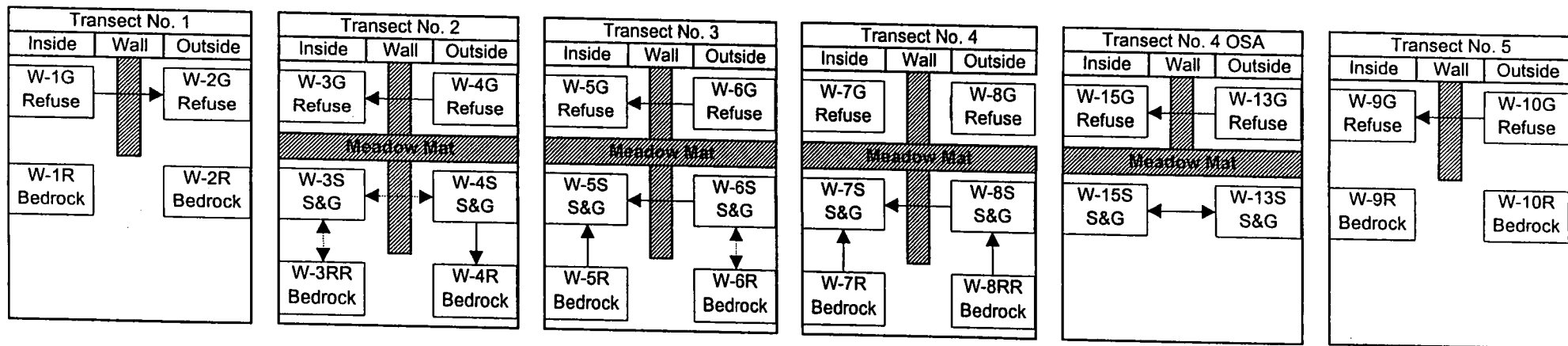
Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2001 Minimum/Maximum Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	July August September 3rd Quarter	12.32	15.61	14.13	W-2G	July August September 3rd Quarter	12.64	13.66	13.22
W-3G	July August September 3rd Quarter	10.47	10.92	10.70	W-4G	July August September 3rd Quarter	10.67	11.45	11.03
W-3S	July August September 3rd Quarter	1.24	2.25	1.22	W-4S	July August September 3rd Quarter	0.27	2.63	1.29
W-5G	July August September 3rd Quarter	10.34	11.19	10.73	W-6G	July August September 3rd Quarter	12.33	13.41	12.88
W-5S	July August September 3rd Quarter	0.96	2.16	1.47	W-6S	July August September 3rd Quarter	1.29	2.45	1.80
W-7S	July August September 3rd Quarter	1.30	2.27	1.69	W-8S	July August September 3rd Quarter	1.79	4.07	2.45
W-15S	July August September 3rd Quarter	2.00	3.00	2.42	W-13S	July August September 3rd Quarter	1.79	3.14	2.29
W-15G	July August September 3rd Quarter	0.44	0.58	0.51	W-13G	July August September 3rd Quarter	6.39	6.85	6.63
W-9G	July August September 3rd Quarter	7.66	8.25	7.95	W-10G	July August September 3rd Quarter	8.61	9.54	9.14

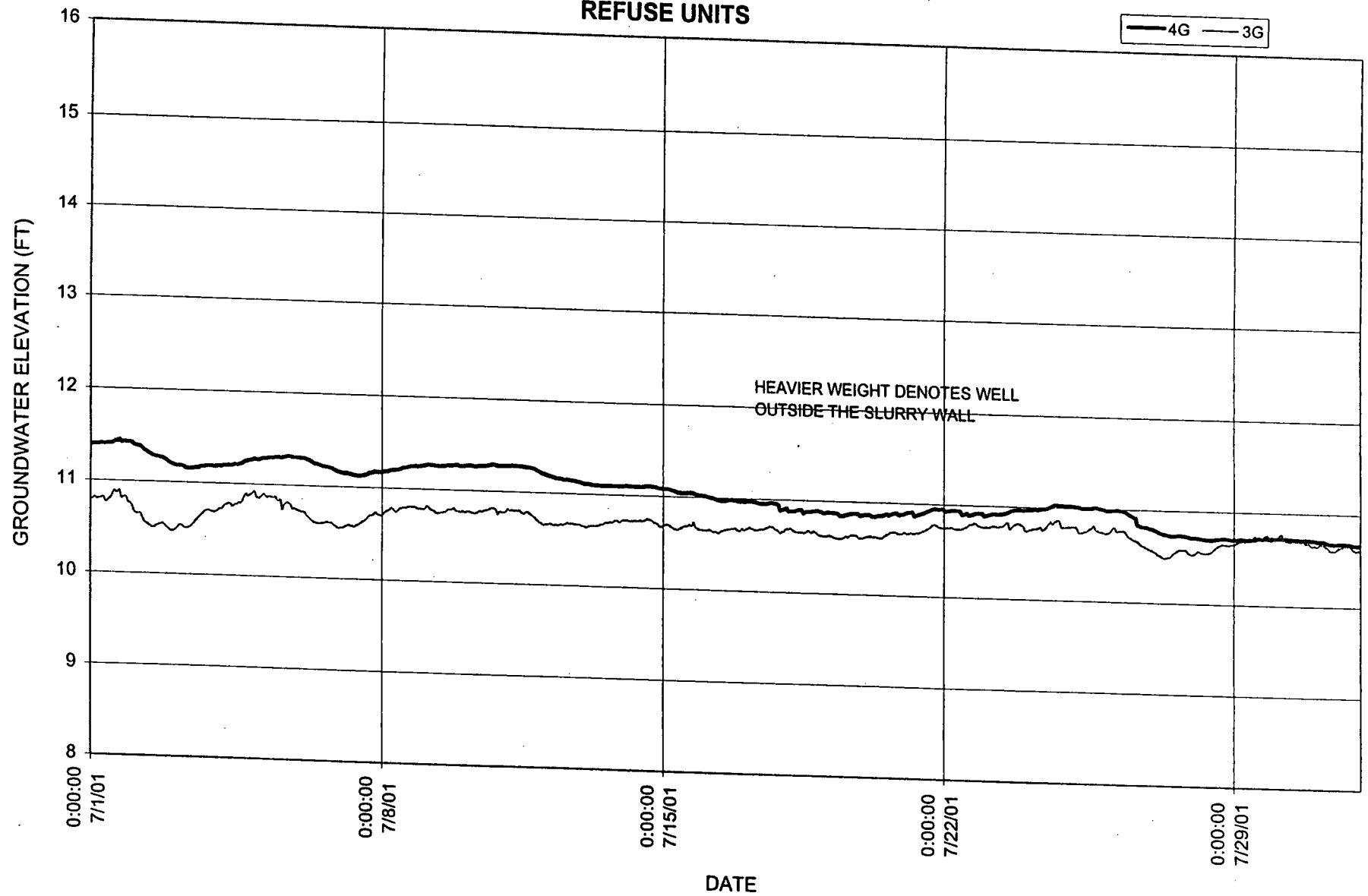
Table 2
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

[illegible]

Figure 1
Kin-Buc Landfill
Hydraulic Profile Summary
July 2001

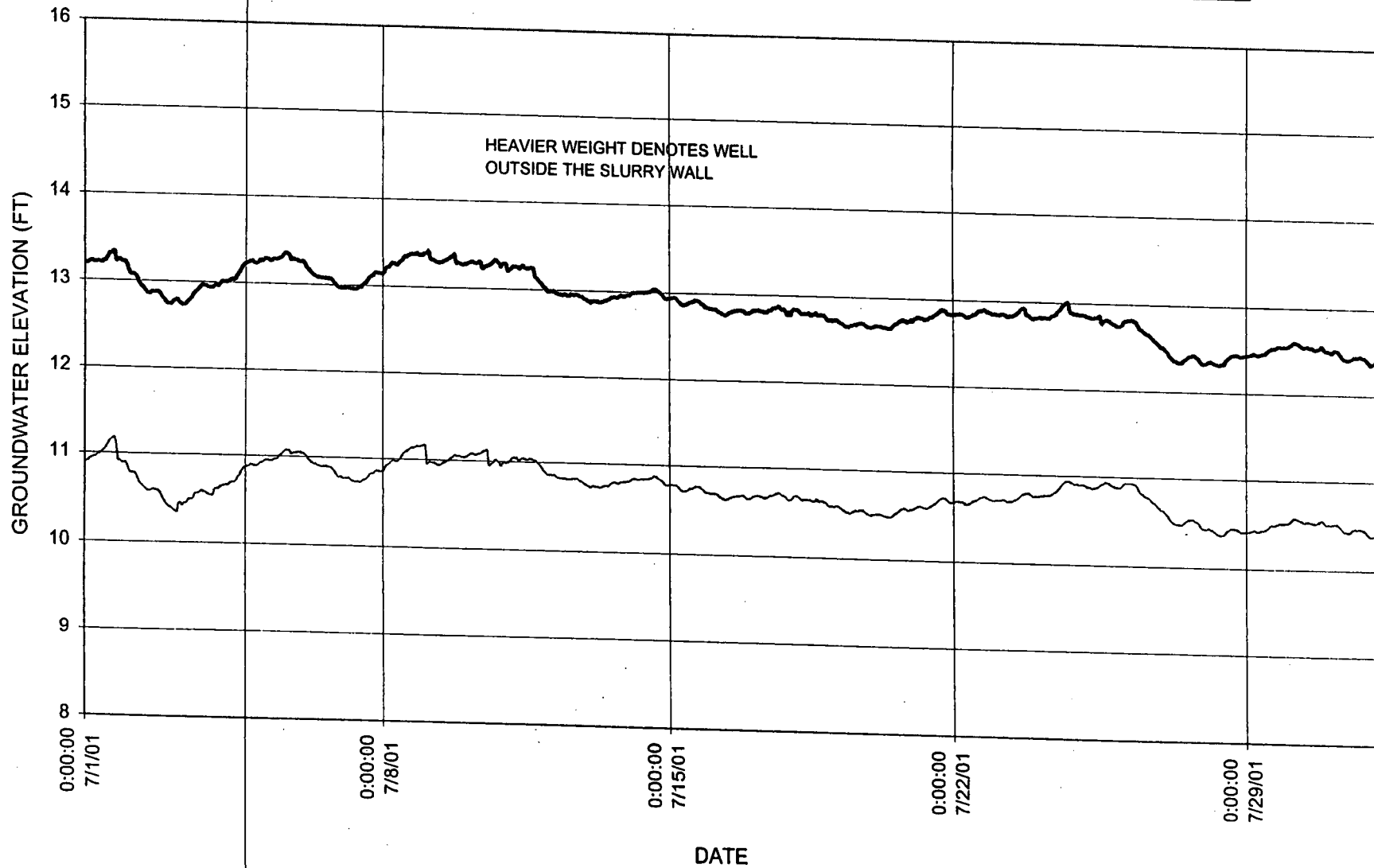


KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #2
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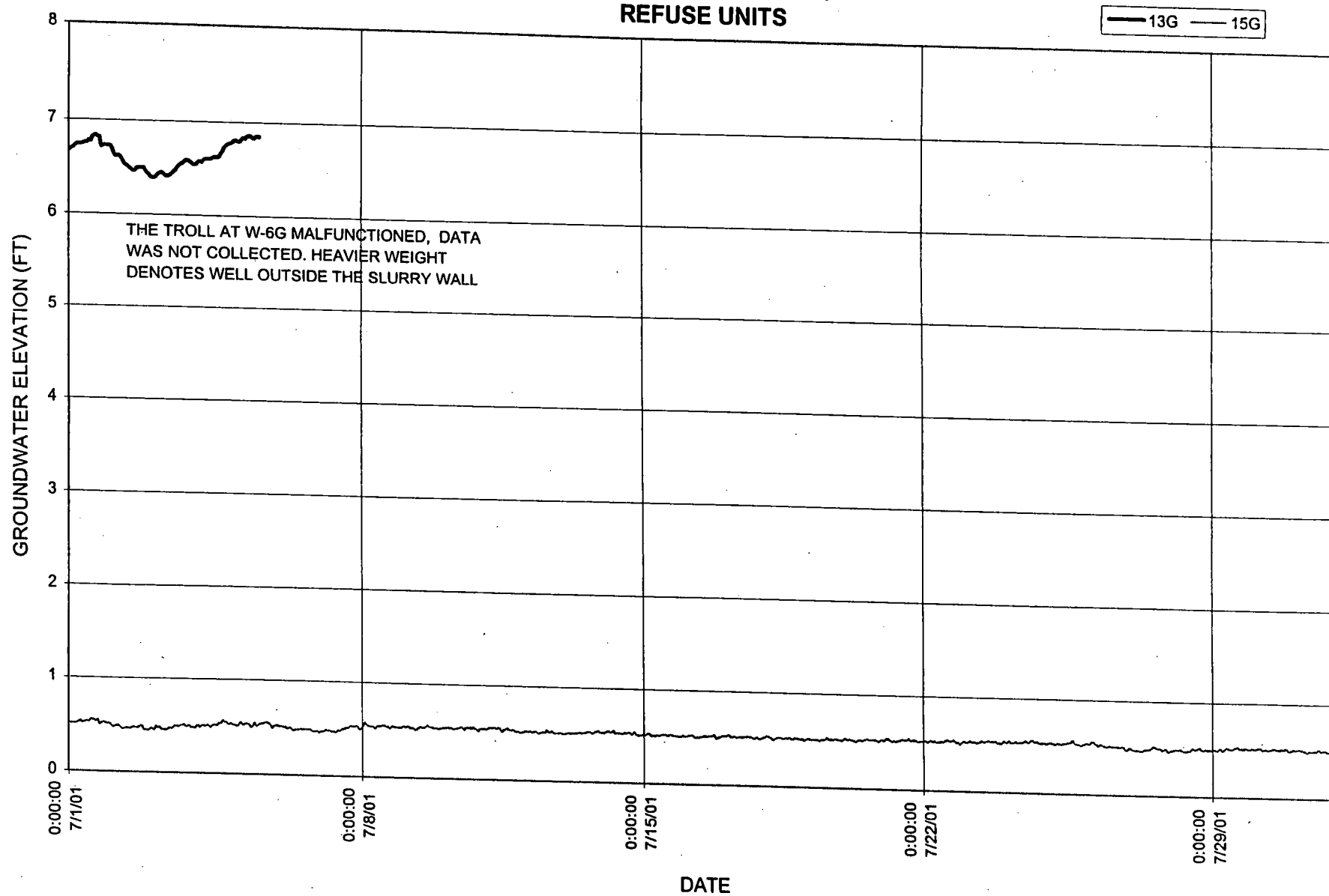


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TRANSECT No.3
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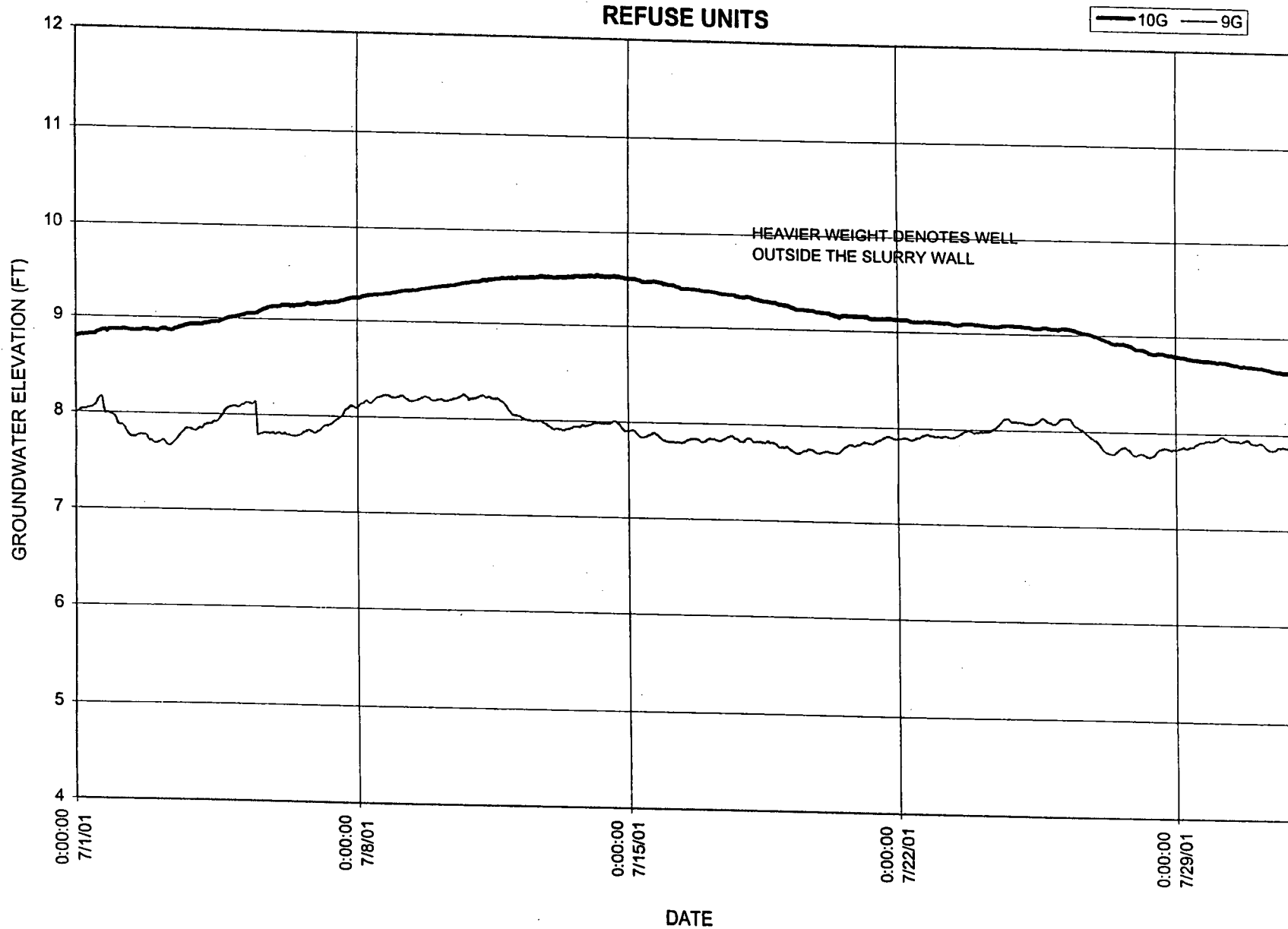
— 5G — 6G



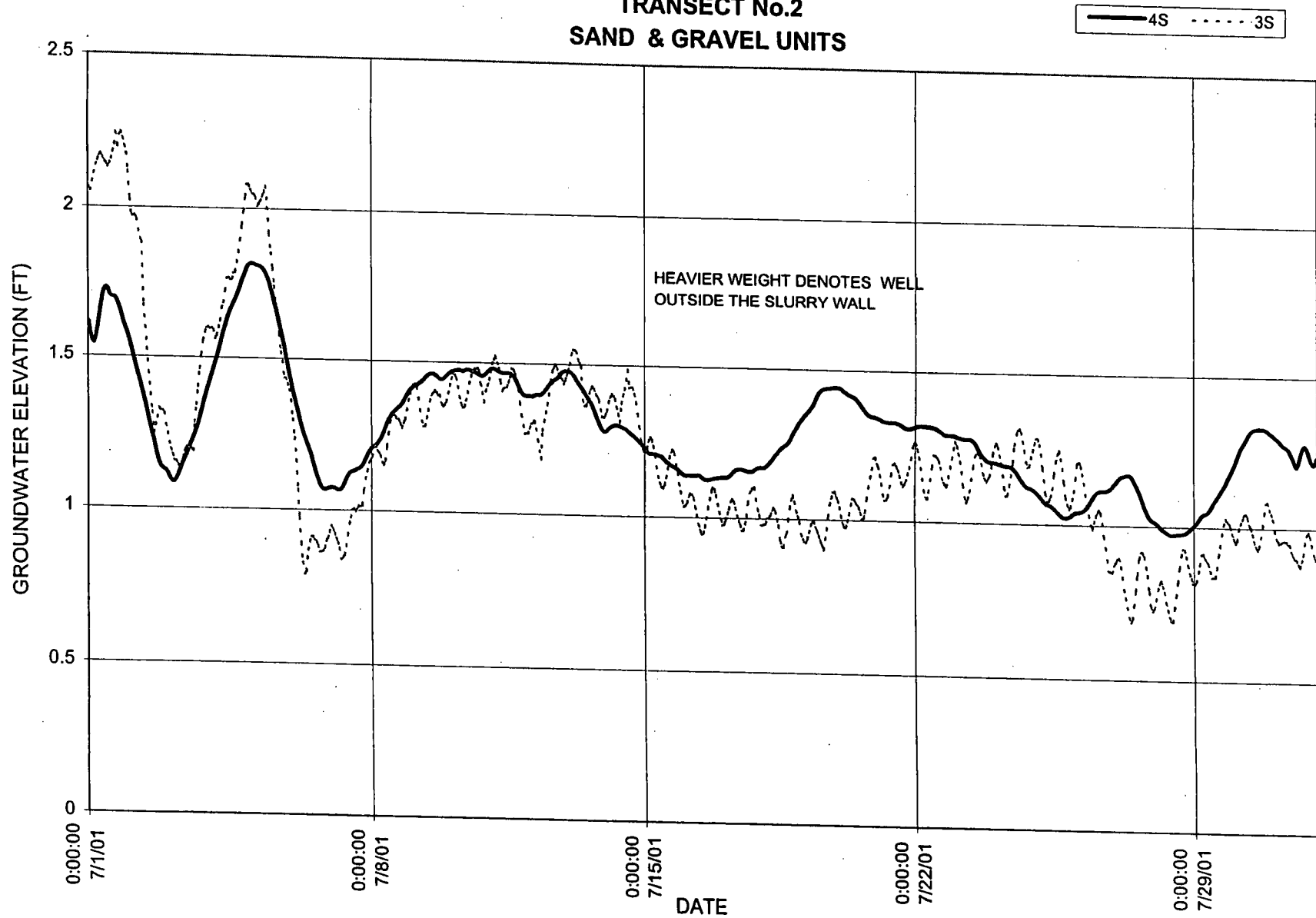
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REFUSE UNITS



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #5
TRANSECT No.5
REFUSE UNITS



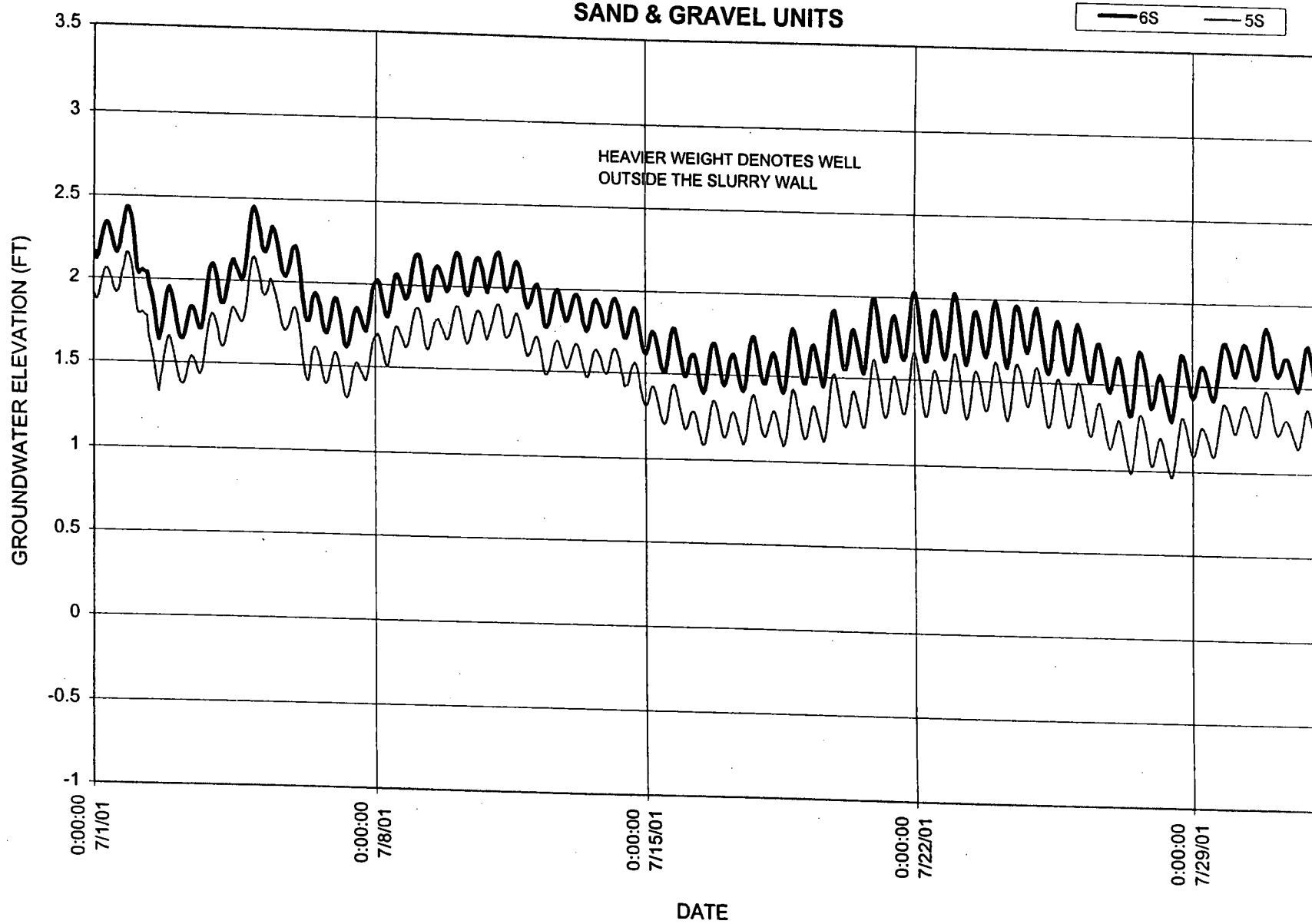
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TRANSECT No.2
SAND & GRAVEL UNITS



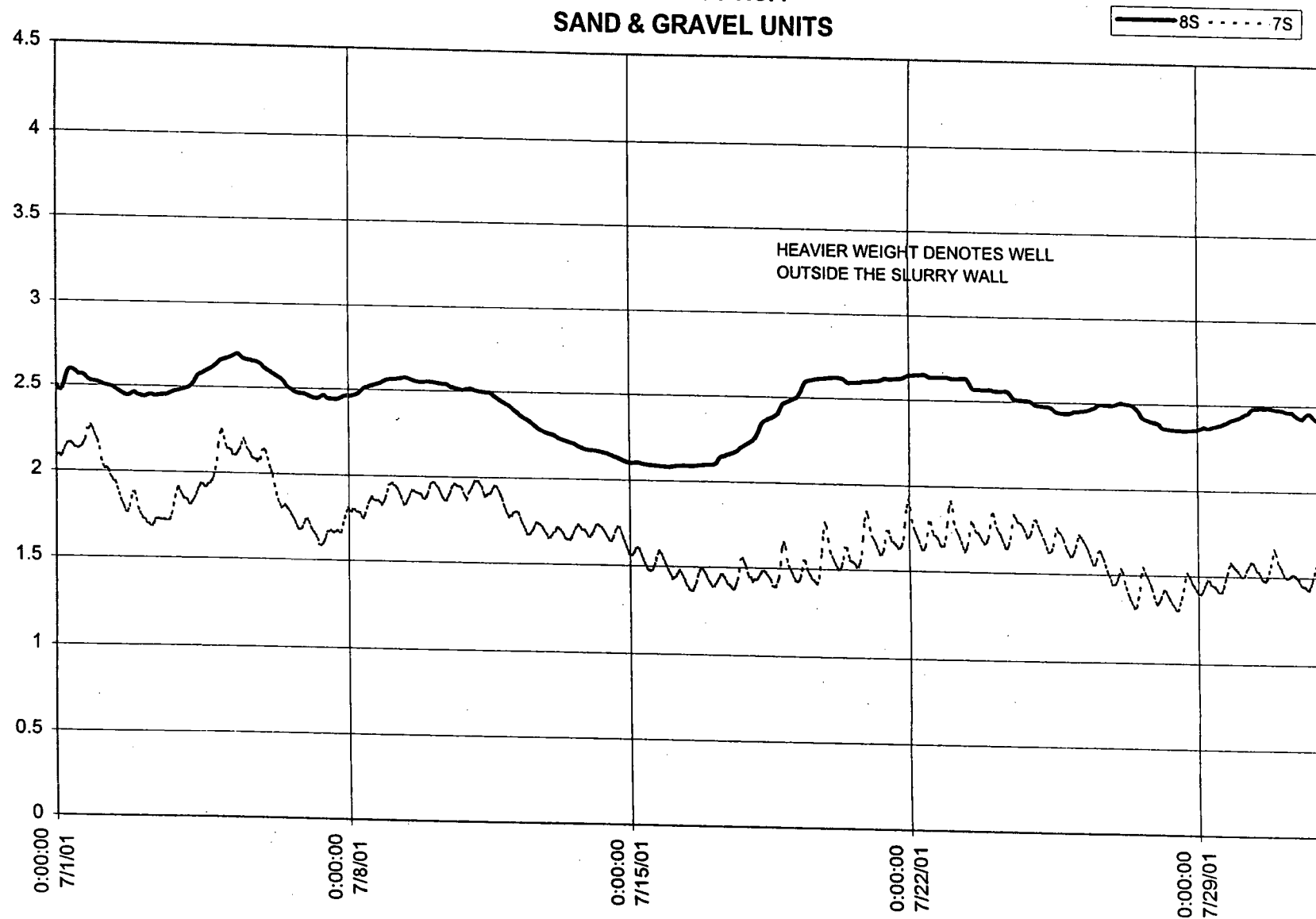
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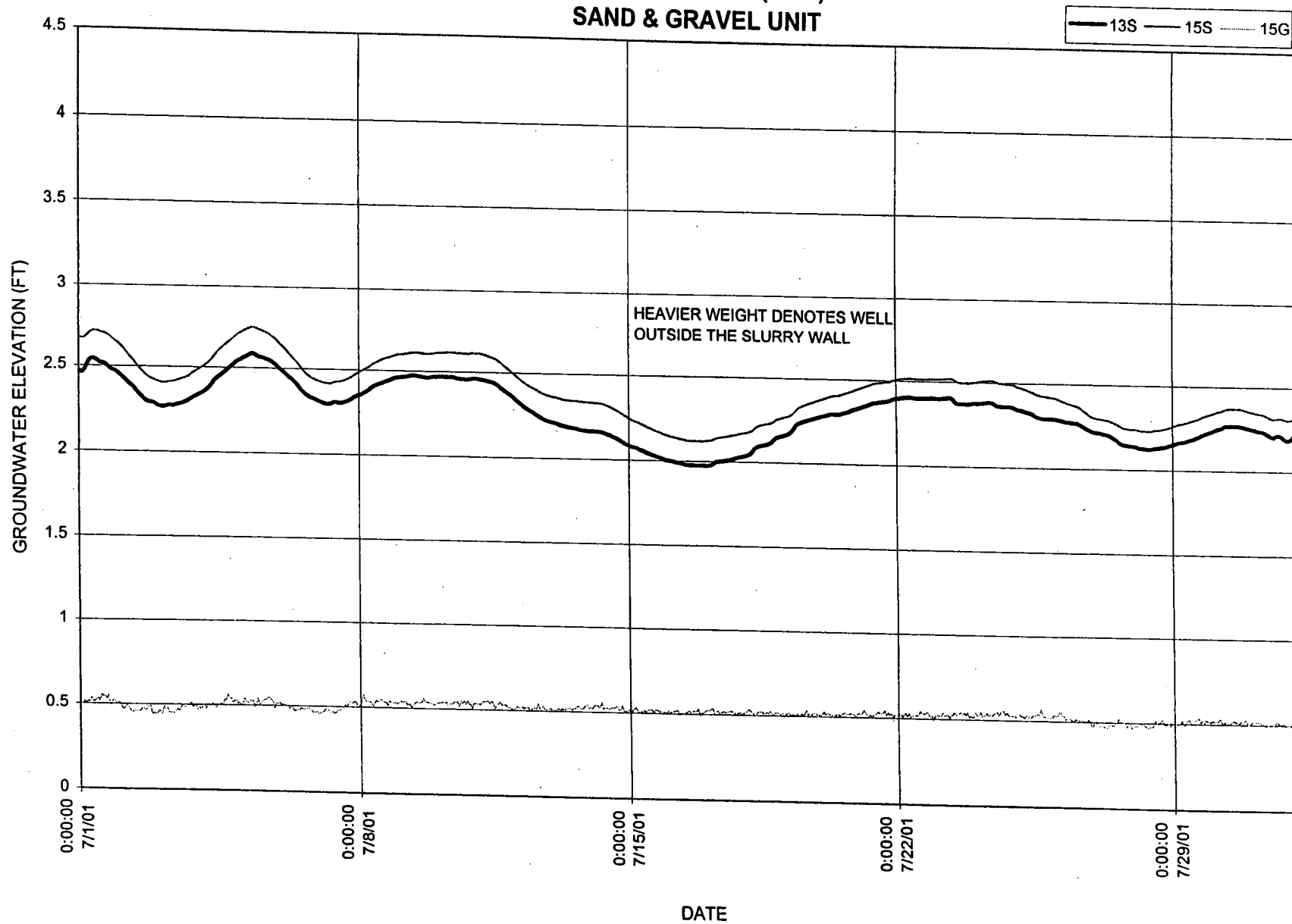
SAND & GRAVEL UNITS



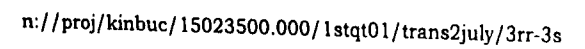
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
TRANSECT No.4
SAND & GRAVEL UNITS



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #9
TRANSECT No.4 (OSA)
SAND & GRAVEL UNIT

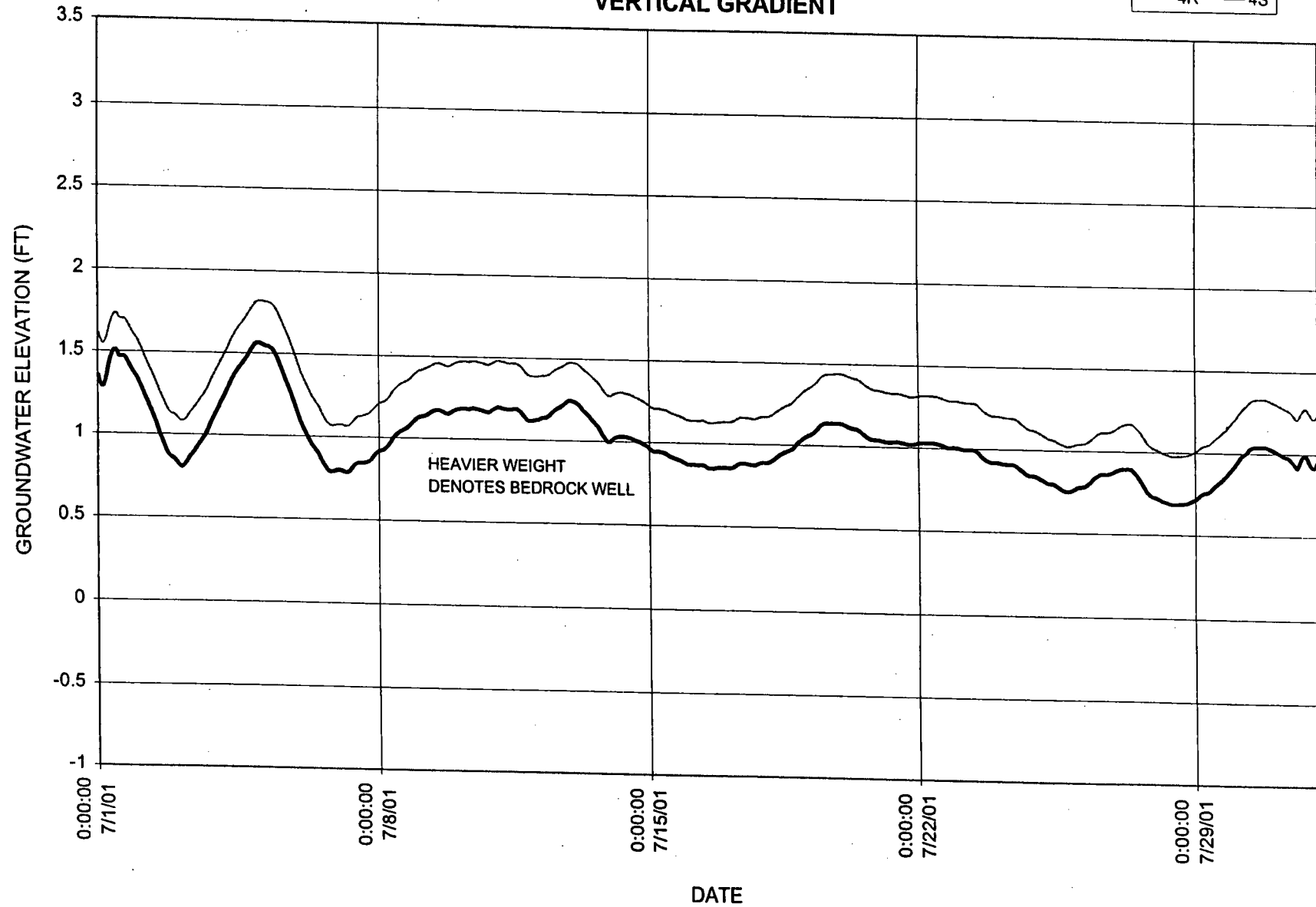


— 3RR — 3S

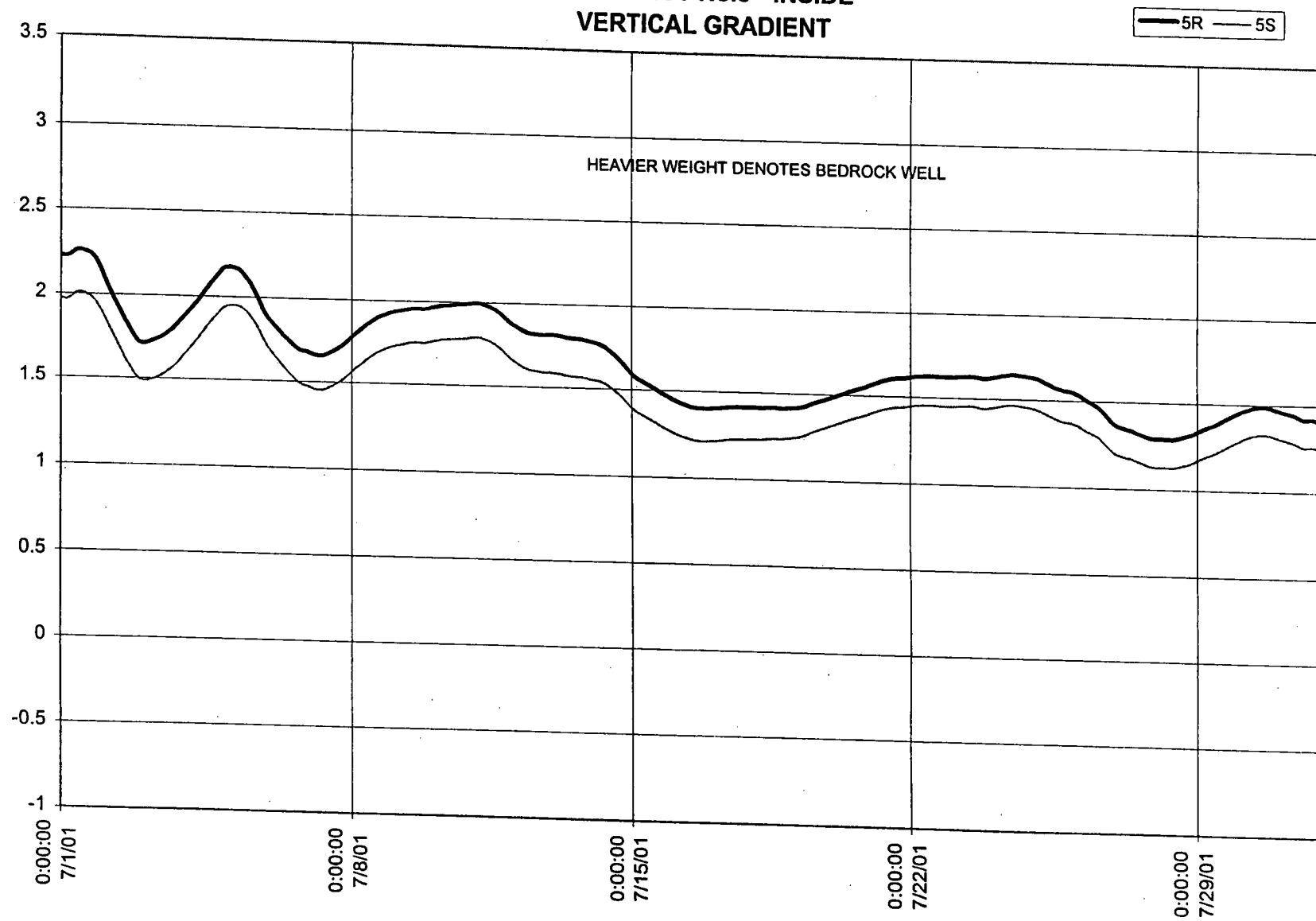


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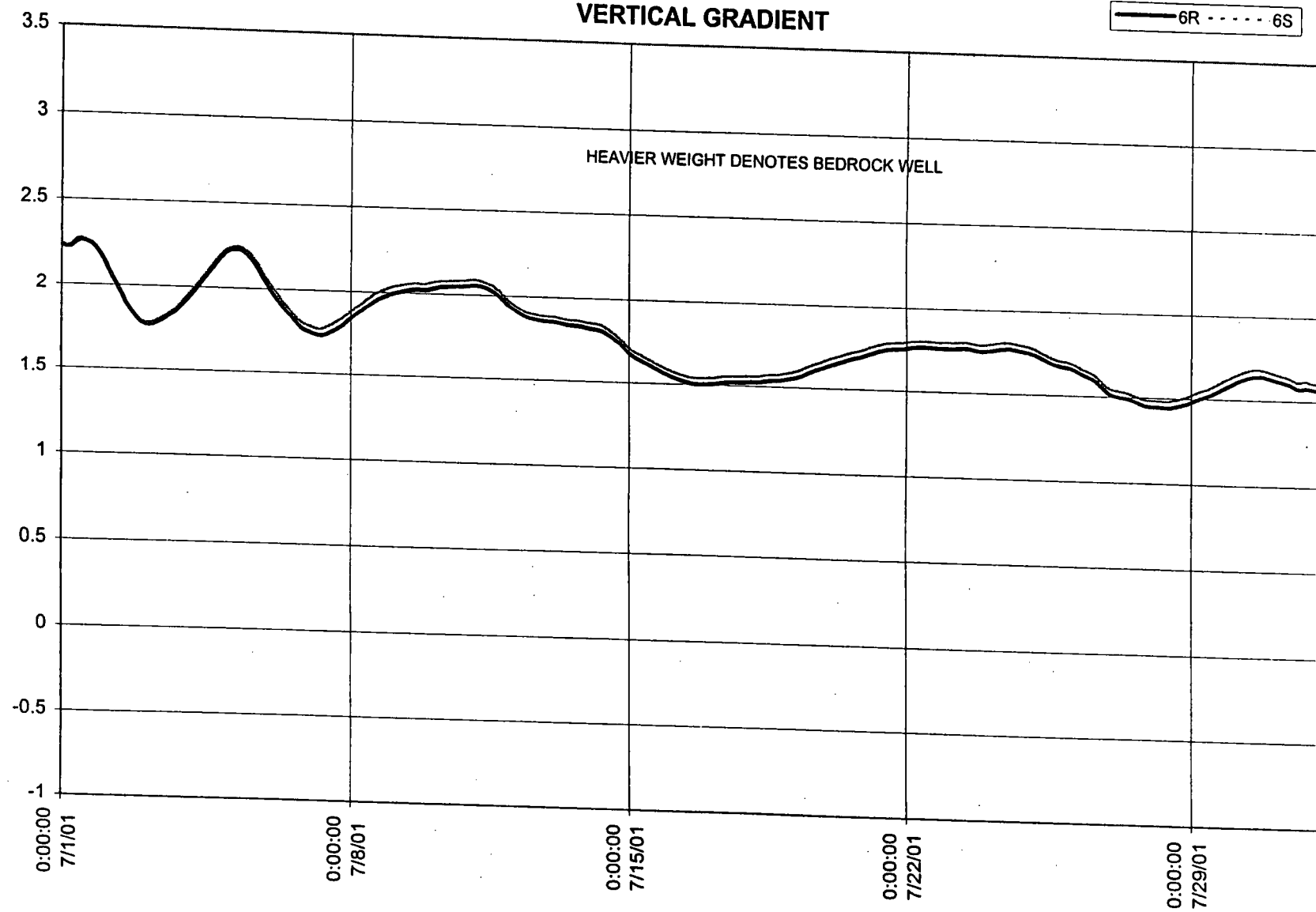
4R 4S



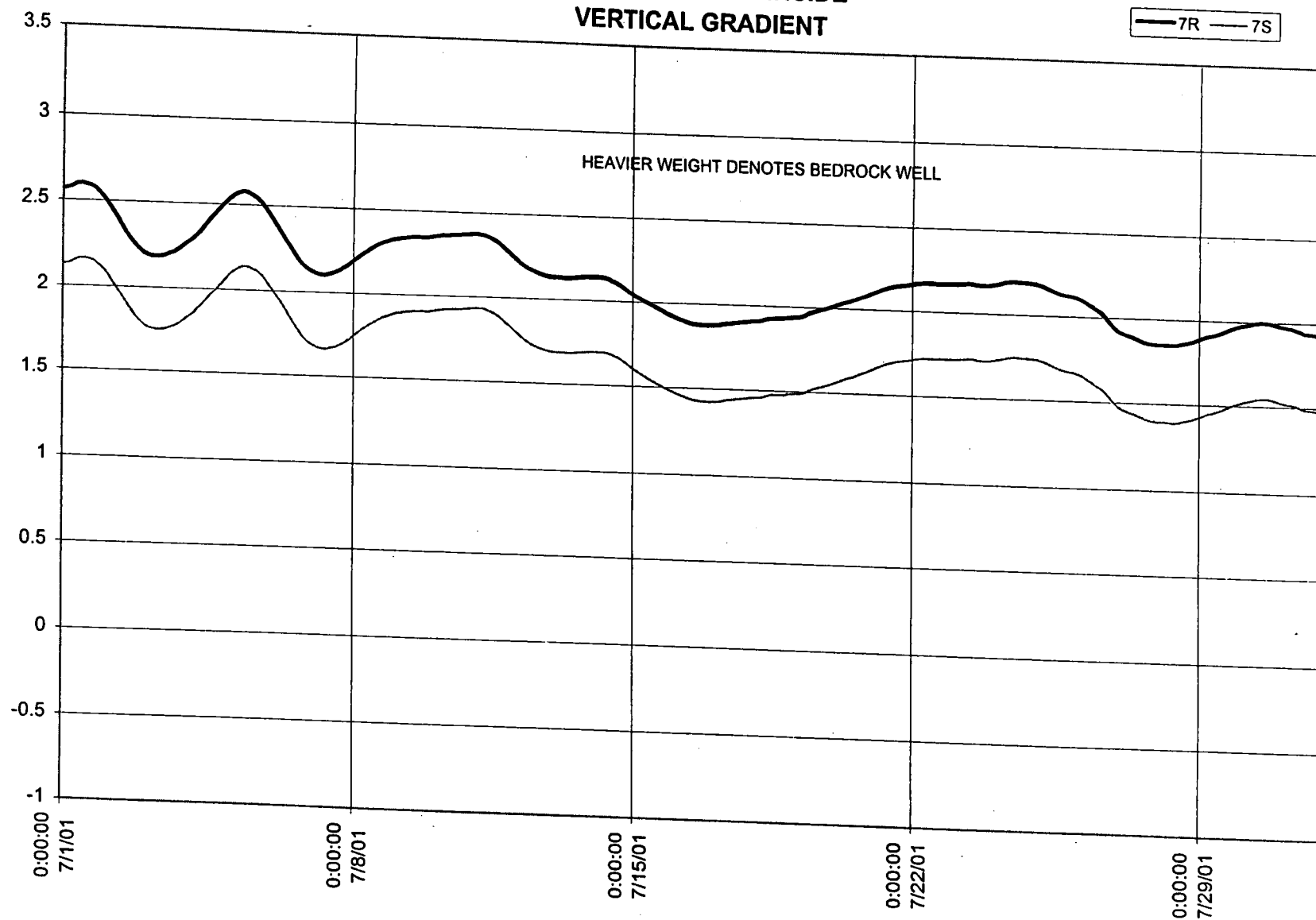
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



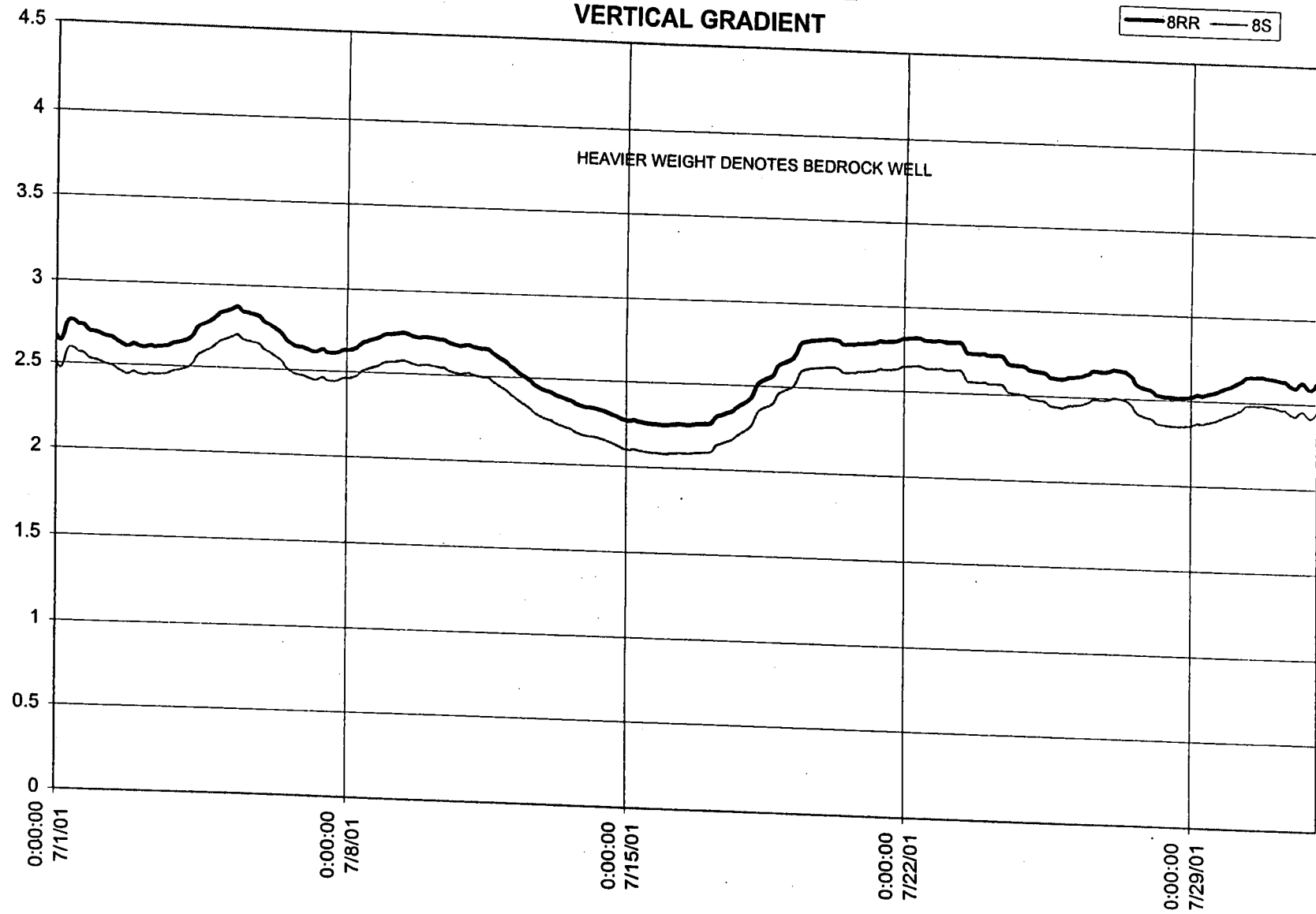
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #13
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #14
TRANSECT No.4- INSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
TRANSECT No.4- OUTSIDE
VERTICAL GRADIENT



**IT Corporation**

Crossroads Corporate Center
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A Member of The IT Group

September 26, 2001

Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for August 2001

Dear Mr. Januszkiewicz:

A site visit was completed on September 5, 2001 to download water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of August 2001 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA in mid-November.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. The continuous water level elevation data was compared with manual readings indicating that the Trolls are functioning properly and are recording accurate data, with the exception of Trolls in Well 13G and 15G. Downloading problems occurred between the data recorder and computer in Well 13G and Well 15G, and data was not collected. The Troll in Well 13G was removed and a new miniTroll was installed in the well. The Troll in Well 15G was removed and it is anticipated that a new miniTroll will be installed in the well during the next site visit in October. Hydrographs have been prepared for each of the transect locations and are enclosed for your reference.

The water levels in wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 shows the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Transect 1

Refuse (1G/2G)/Hydrograph No. 1 - Intragradients were not observed during the month. Water levels in well W-1G (inside the wall) increased by two feet over a period from July 10 through the month of August. This pattern of increased water levels has been observed on several previous occasions and may be related to localized conditions around the well. Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 2, and indicate that the leachate collection system is functioning properly.

Mr. Carl Januszkiewicz
September 26, 2001
Page 2

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The fact that the leachate collection system is functioning properly suggests that intragradient conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

Transect 2

Refuse (3G/4G)/Hydrograph No. 2 - Intragradient conditions were not consistently observed during the month. Groundwater levels outside the slurry wall were depressed for an unknown reason during the first two weeks of the month. Intragradient conditions were reestablished approximately August 14, 2001 and were maintained for the remainder of the month. The average monthly water elevation for Well 3G (inside) and Well 4G (outside) was 10.64 and 10.74 feet msl, respectively. The monthly averages were within 0.2 feet, however there appears to be a small inward gradient.

Sand and Gravel (3S/4S)/Hydrograph No. 6 - Intragradient conditions were not consistently observed during the month. The average monthly water elevation for Well 3S (inside) and Well 4S (outside) was 1.18 and 1.26 feet msl, respectively. The monthly averages were within 0.2 feet, however there appears to be a small inward gradient.

Vertical Gradient (3S/3RR)-Inside/Hydrograph No. 10 - Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units inside the slurry wall. The average monthly water elevation for both Well 3S (sand & gravel) and 3RR (bedrock) was 1.18 feet msl.

Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 - The vertical gradient between the bedrock and overlying sand & gravel units was in a downward direction throughout the month. The average monthly water elevation for Well 4S (sand & gravel) and 4R (bedrock) was 1.26 and 0.99 feet msl, respectively.

Transect 3

Refuse (5G/6G)/Hydrograph No. 3 - Intragradient conditions were maintained throughout the month.

Sand and Gravel (5S/6S)/Hydrograph No. 7 - Intragradient conditions were maintained throughout the month.

Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 - Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month.

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Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall. The difference in average monthly water elevations for Well 6S (sand & gravel) and 6R (bedrock) was less than 0.2 feet.

Transect 4

Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – The automatic data recorder for W-13G, outside the wall, malfunctioned, and a new miniTroll was installed into the well during the site visit of September 5, 2001. The automatic data recorder for W-15G, inside the wall, also malfunctioned. Data in Well 15G was collected until August 14, 2001. The August manual water elevations for Well 13G and Well 15G was 6.22 and 0.82 feet msl, respectively. These readings indicate significant intragradient conditions being maintained at this location.

Sand and Gravel (7S/8S)/Hydrograph No. 8 - Intragradient conditions were maintained throughout the month.

Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 - Due to an upward gradient between the sand & gravel and refuse units in the oil seeps area, groundwater was not collected from the sand & gravel unit. Hydrograph No. 9 shows the ambient conditions between Wells W-15S (outside) and W-13S (inside) in the sand & gravel unit. Water levels from Well W-15G in the refuse unit are included on the hydrograph for comparison.

Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 - Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month.

Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 - Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month.

Transect 5

Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month.

Figure 1 shows the hydraulic profile summary for August 2001.

Mr. Carl Januszkiewicz
September 26, 2001
Page 4

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Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from August 1 to August 31, 2001:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
1,485 gal.	318,237 gal.	214,854 gal.	432 gal.	33,906 gal.
48 gpd	10,266 gpd	6,931 gpd	14 gpd	1,094 gpd

For the period, a total of 535,008 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells of 17,258 gpd meets the recommended extraction rate of 15,000 gpd. The extraction rates from S&G No. 2 of 10,266 gpd and S&G No. 3 of 6,931 gpd meet the recommended extraction rates from S&G No. 2 and S&G No. 3 of 10,000 gpd and 5,000 gpd, respectively.

The leachate extraction rate of 1,094 gpd does not meet the recommended rate of 1,500 gpd. Intragradients were maintained in the refuse unit at all of the transect locations throughout the month with the exception of Transects 1 and 2. As discussed earlier, leachate levels in the collection system cleanouts suggest that intragradients are being maintained at Transect 1 even though water levels in the monitoring wells do not indicate this condition. Intragradients were not consistently maintained in the refuse unit of Transect 2, but as discussed earlier, there appears to be a small inward gradient.

CONCLUSIONS

- Intragradients were maintained in the refuse unit at Transects 3, 4, and 5.
- Intragradients were not observed for the entire month of August in the refuse unit at Transect 2.
- Intragradients were not indicated by the monitoring wells in the refuse unit at Transect 1, although there is evidence that intragradients may be present at this location.
- Intragradients were maintained in the sand & gravel unit at Transects 3 and 4. Intragradients were not consistently observed in the sand & gravel unit at Transect 2.

Mr. Carl Januszkiewicz
September 26, 2001
Page 5

Project 791186

- Inside the slurry wall, upward gradient conditions were observed between the bedrock and overlying sand & gravel unit at Transects 3 and 4. Upward gradient conditions were not consistently observed at Transect 2.
- Outside the slurry wall, upward gradient conditions were observed between the bedrock and overlying sand & gravel unit at Transect 4. Upward gradient conditions were not consistently observed at Transect 3, and an upward gradient condition was not observed at Transect 2.

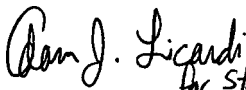
RECOMMENDATIONS


- The leachate collection rate should be increased to 1,500 gpd from the August average of 1,094 gpd.
- Although intragradient conditions were not consistently observed at Transect 2, we recommend maintaining the collection rate for S&G No. 2 at 10,000 gpd. If the existing conditions persist it may be necessary to increase the collection rate at this location.
- The collection rate for S&G No. 3 should be maintained at 5,000 gpd.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

Sincerely,

IT CORPORATION


for Steven Goldberg
Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist


Thomas Connors, P.E.
Project Manager

Attachments

cc: Glenn Grieb, US Filter

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2001 Minimum/Maximum Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	July	12.32	15.61	14.13	W-2G	July	12.64	13.66	13.22
	August	14.26	14.99	14.62		August	12.09	13.09	12.81
	September					September			
	July-Aug.	12.32	15.61	14.37		July-Aug.	12.09	13.66	13.01
W-3G	July	10.47	10.92	10.70	W-4G	July	10.67	11.45	11.03
	August	10.45	10.84	10.64		August	10.59	10.99	10.74
	September					September			
	July-Aug.	10.45	10.92	10.67		July-Aug.	10.59	11.45	10.88
W-3S	July	0.69	2.25	1.22	W-4S	July	0.27	2.63	1.29
	August	0.67	1.99	1.18		August	0.32	2.53	1.26
	September					September			
	July-Aug.	0.67	2.25	1.20		July-Aug.	0.27	2.63	1.28
W-5G	July	10.34	11.19	10.73	W-6G	July	12.33	13.41	12.88
	August	10.32	11.07	10.82		August	12.27	12.99	12.63
	September					September			
	July-Aug.	10.32	11.19	10.78		July-Aug.	12.27	13.41	12.76
W-5S	July	0.96	2.16	1.47	W-6S	July	1.29	2.45	1.80
	August	0.89	1.93	1.31		August	1.22	2.45	1.66
	September					September			
	July-Aug.	0.89	2.16	1.40		July-Aug.	1.22	2.45	1.73
W-7S	July	1.30	2.27	1.69	W-8S	July	1.79	4.07	2.45
	August	1.20	2.05	1.58		August	1.84	4.17	2.42
	September					September			
	July-Aug.	1.20	2.27	1.64		July-Aug.	1.79	4.17	2.43
W-15S	July	2.00	3.00	2.42	W-13S	July	1.79	3.14	2.29
	August	1.93	2.98	2.36		August	1.75	3.21	2.23
	September					September			
	July-Aug.	1.93	3.00	2.39		July-Aug.	1.75	3.21	2.26
W-15G	July	0.74	0.87	0.81	W-13G	July 1-5	6.39	6.85	6.63
	August 1-14	0.79	0.87	0.82		August	NA	NA	6.22 *
	September					September			
	July-Aug. 14	0.74	0.87	0.81		July-Aug.	NA	NA	NA
W-9G	July	7.66	8.25	7.93	W-10G	July	8.61	9.54	9.14
	August	7.62	8.20	7.95		August	8.35	9.04	8.69
	September					September			
	July-Aug.	7.62	8.25	7.94		July-Aug.	8.35	9.54	8.92

Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2001 Minimum/Maximum Water Elevations

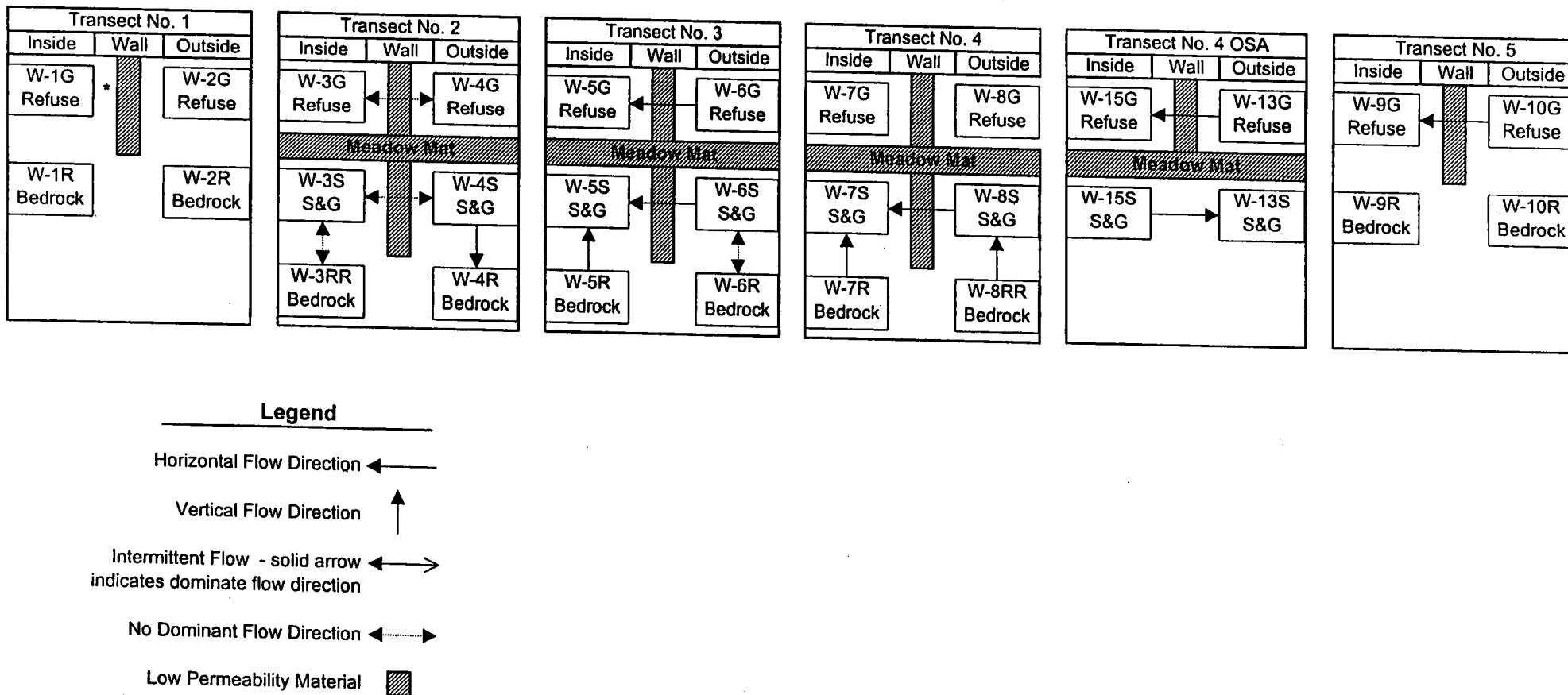
Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Month	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-3RR	July	0.40	2.52	1.19	W-4R	July	-0.12	2.50	1.01
	August	0.44	2.33	1.18		August	-0.13	2.44	0.99
	September					September			
	July-Aug.	0.40	2.52	1.18		July-Aug.	-0.13	2.50	1.00
W-5R	July	1.13	2.40	1.67	W-6R	July	1.27	2.42	1.77
	August	1.06	2.13	1.48		August	1.19	2.20	1.62
	September					September			
	July-Aug.	1.06	2.40	1.57		July-Aug.	1.19	2.42	1.69
W-7R	July	1.76	2.70	2.14	W-8RR	July	1.96	4.22	2.61
	August	1.66	2.49	2.04		August	2.00	4.33	2.59
	September					September			
	July-Aug.	1.66	2.70	2.09		July-Aug.	1.96	4.33	2.60

Note: * This elevation is calculated from a manual water level collected on September 5, 2001.

Table 2
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

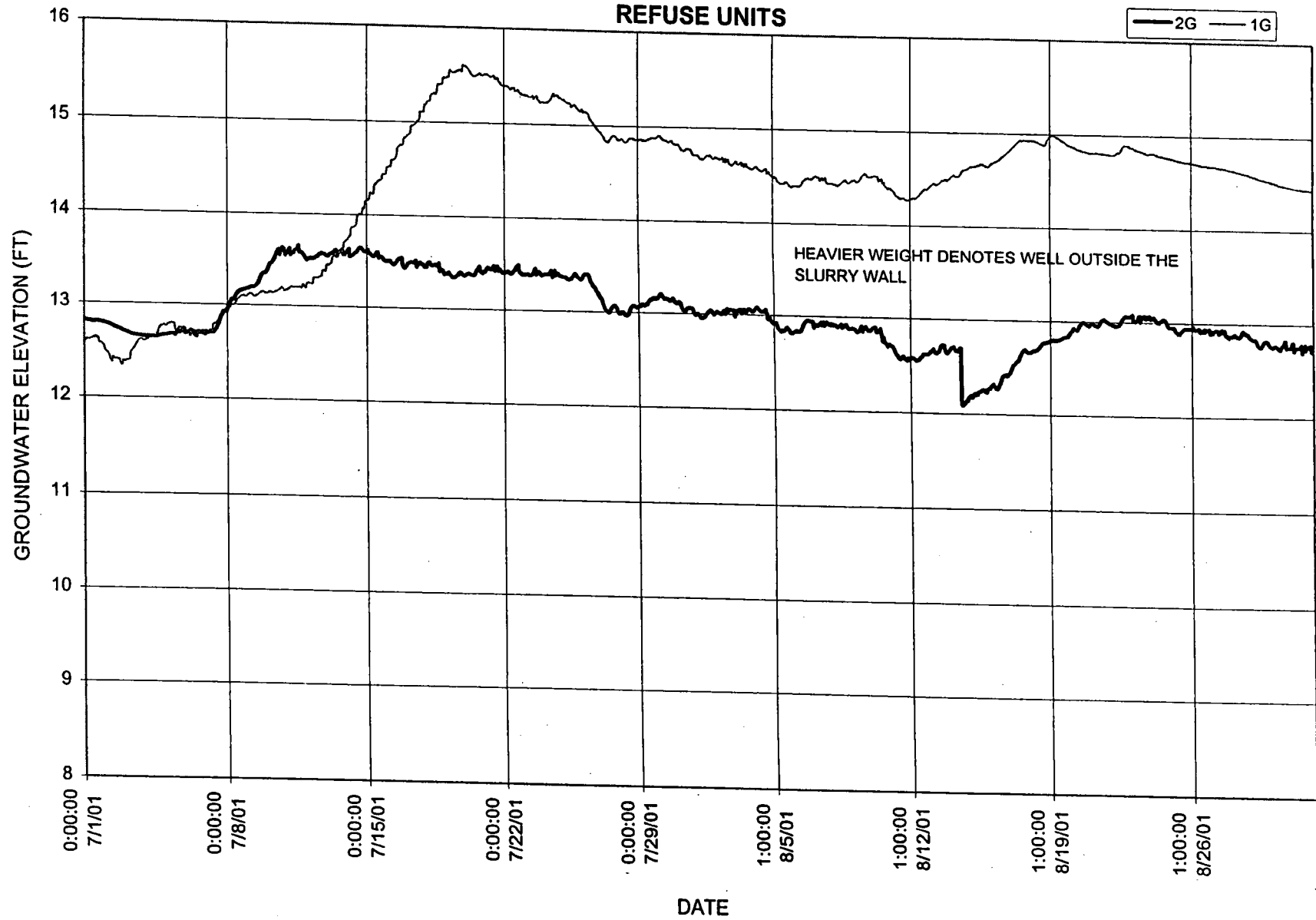
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Figure 1
Kin-Buc Landfill
Hydraulic Profile Summary
August 2001

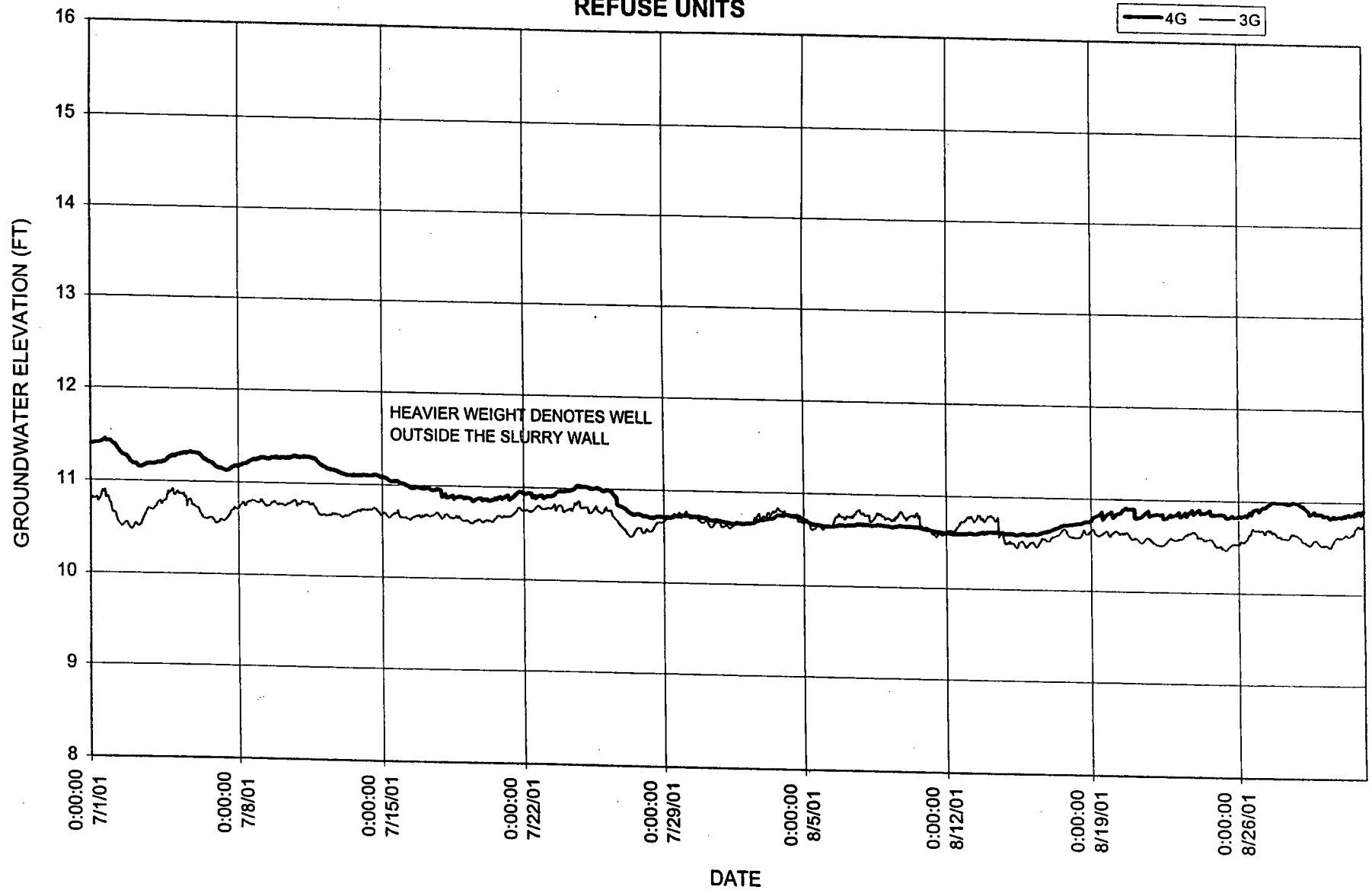


NOTE: * The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

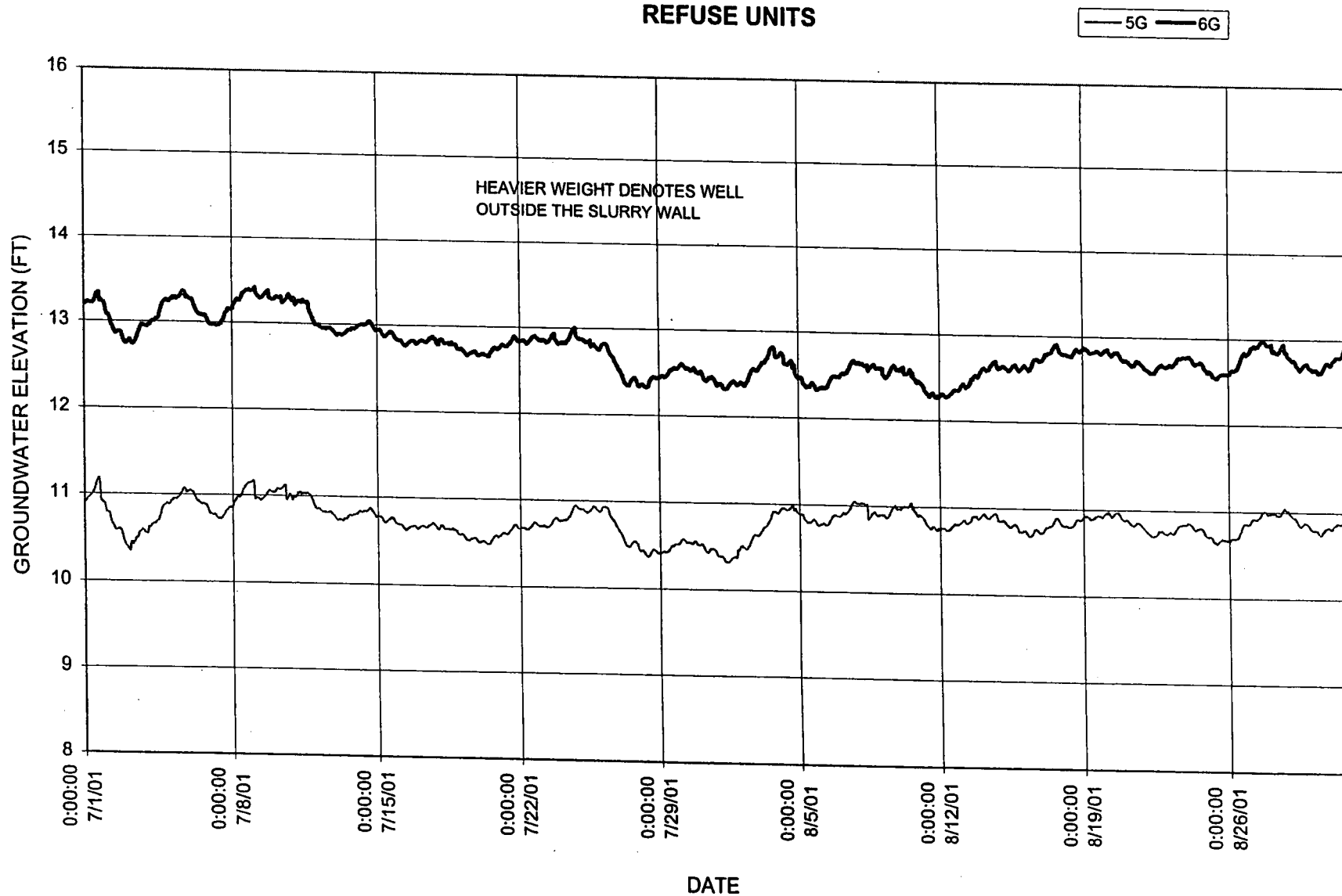
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REFUSE UNITS



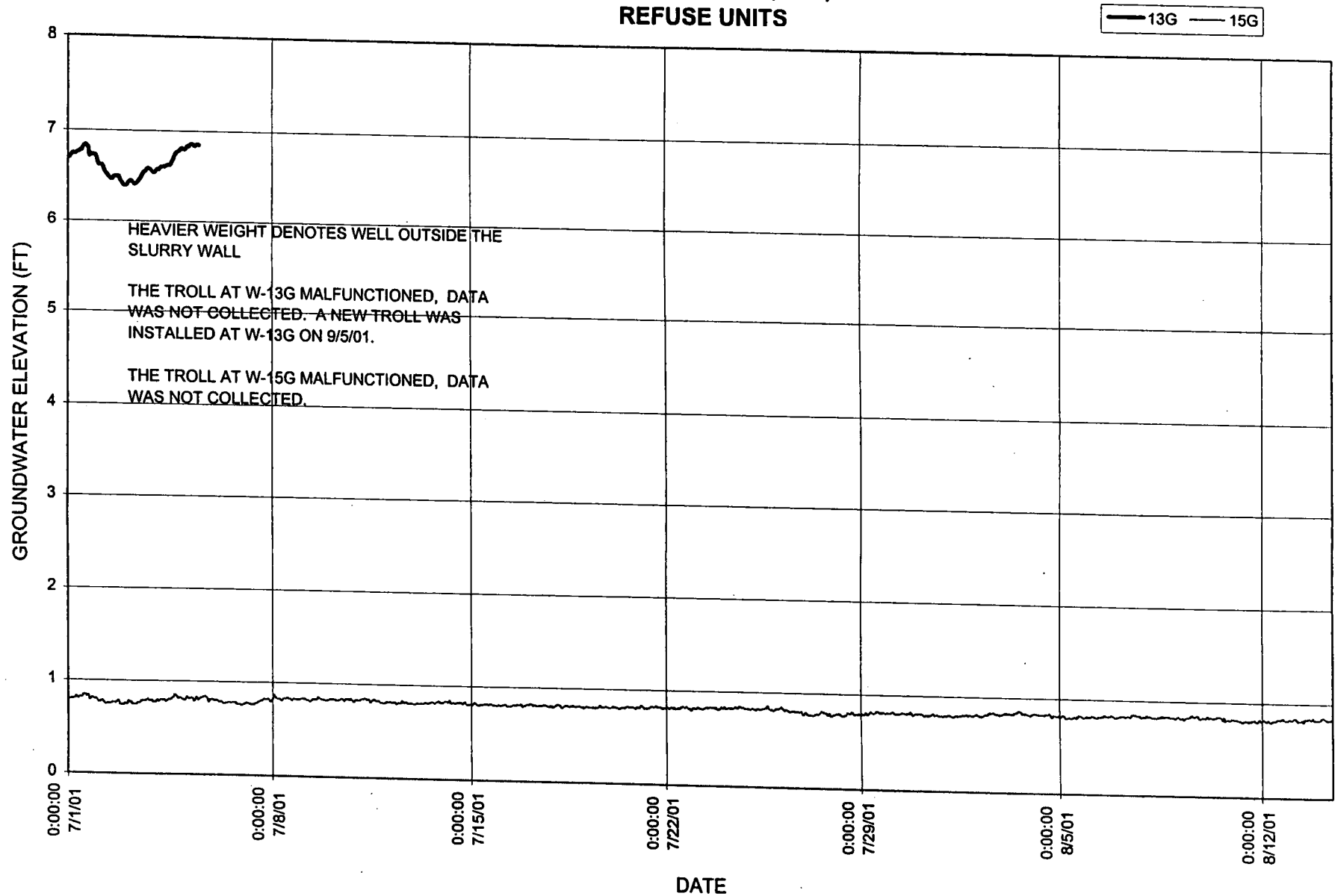
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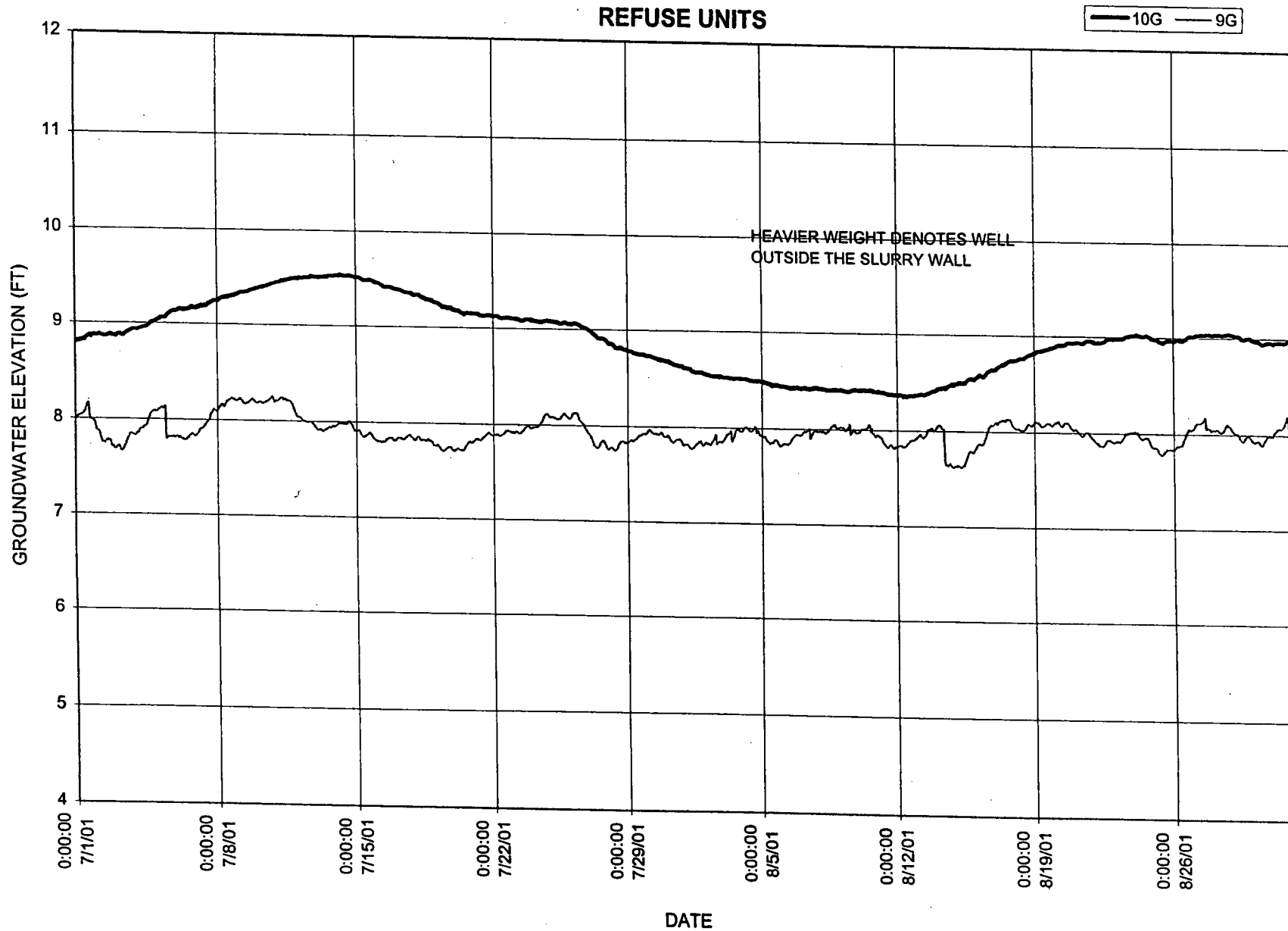
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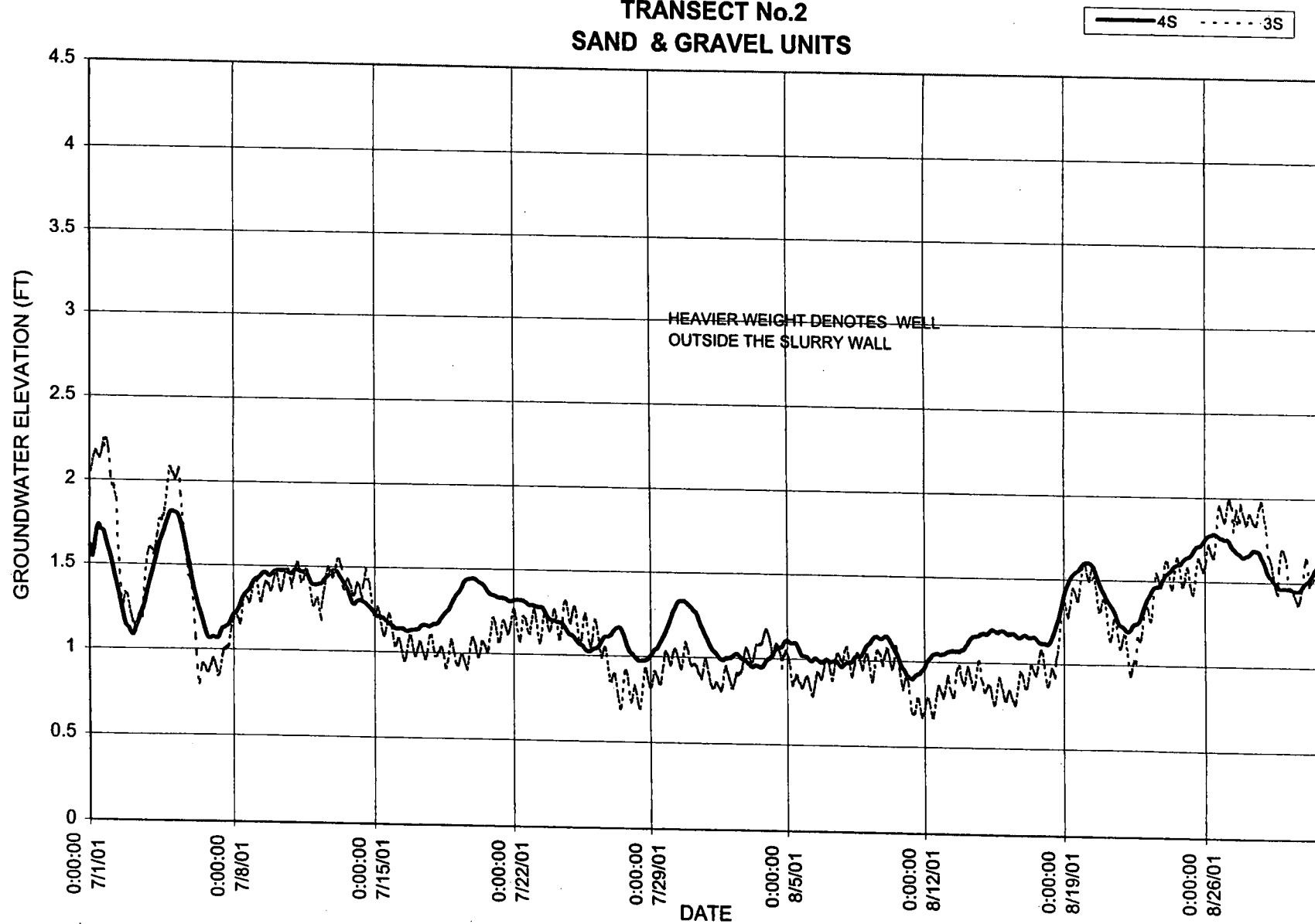
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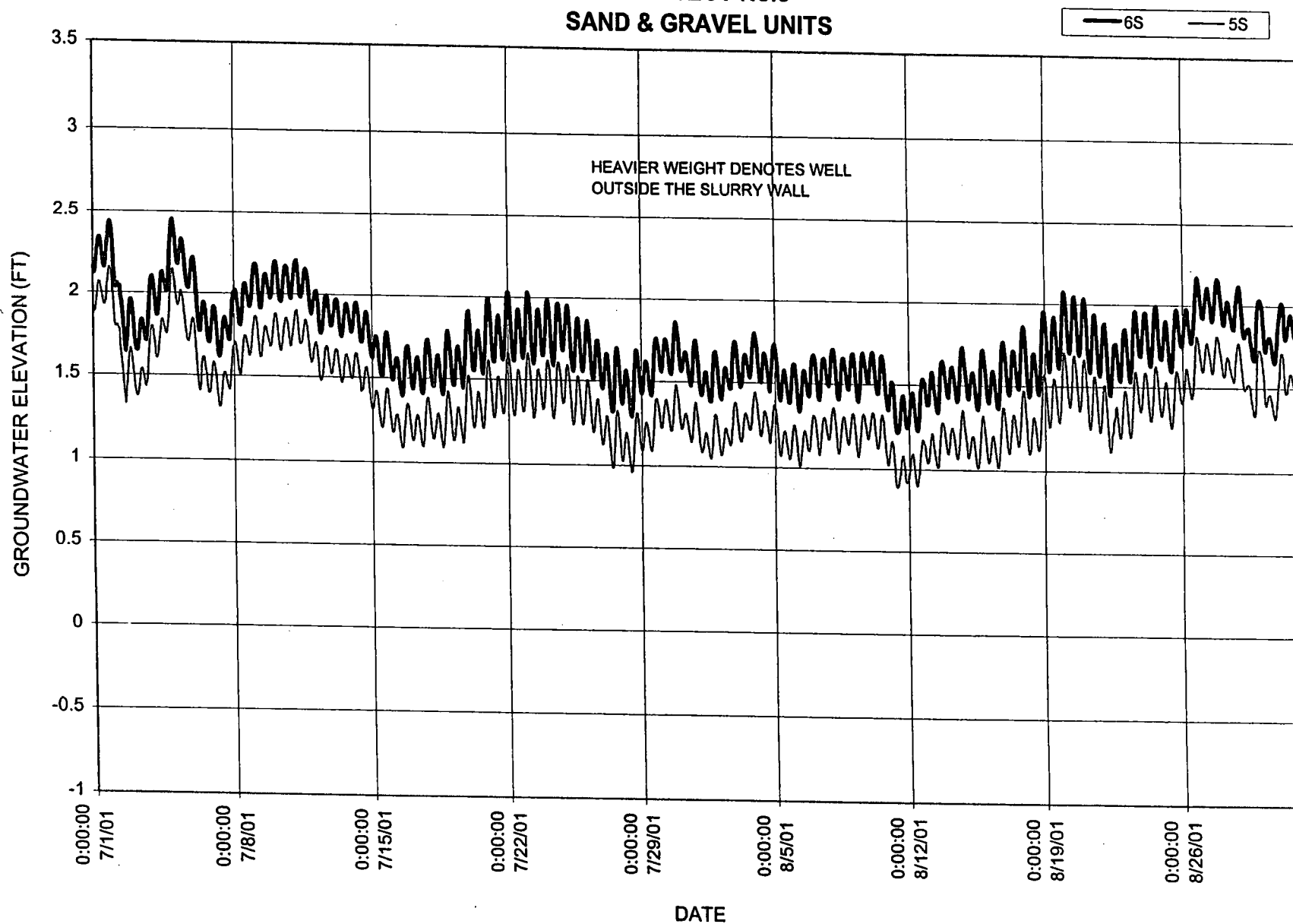
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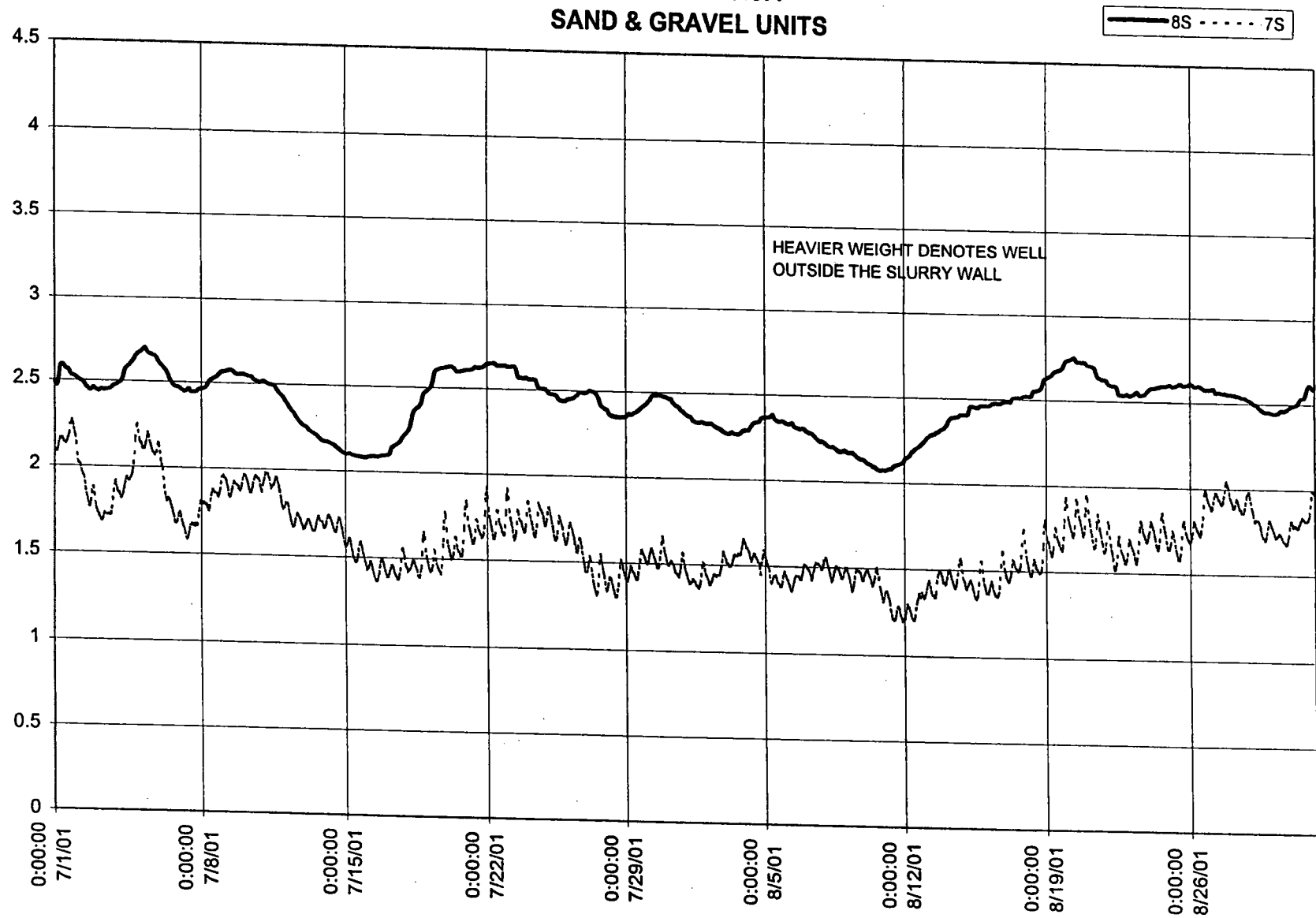
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SAND & GRAVEL UNITS



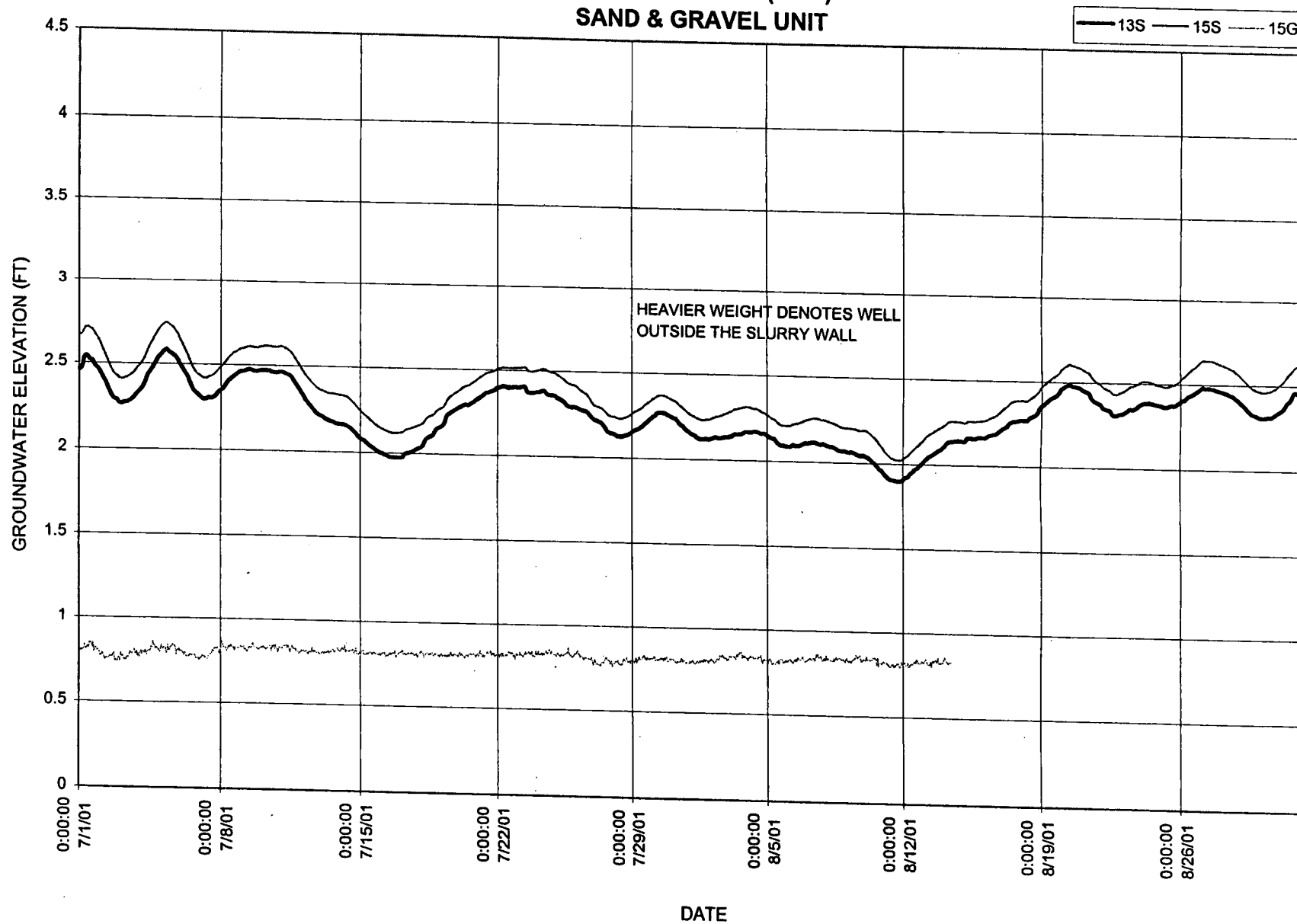
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TRANSECT No.3
SAND & GRAVEL UNITS



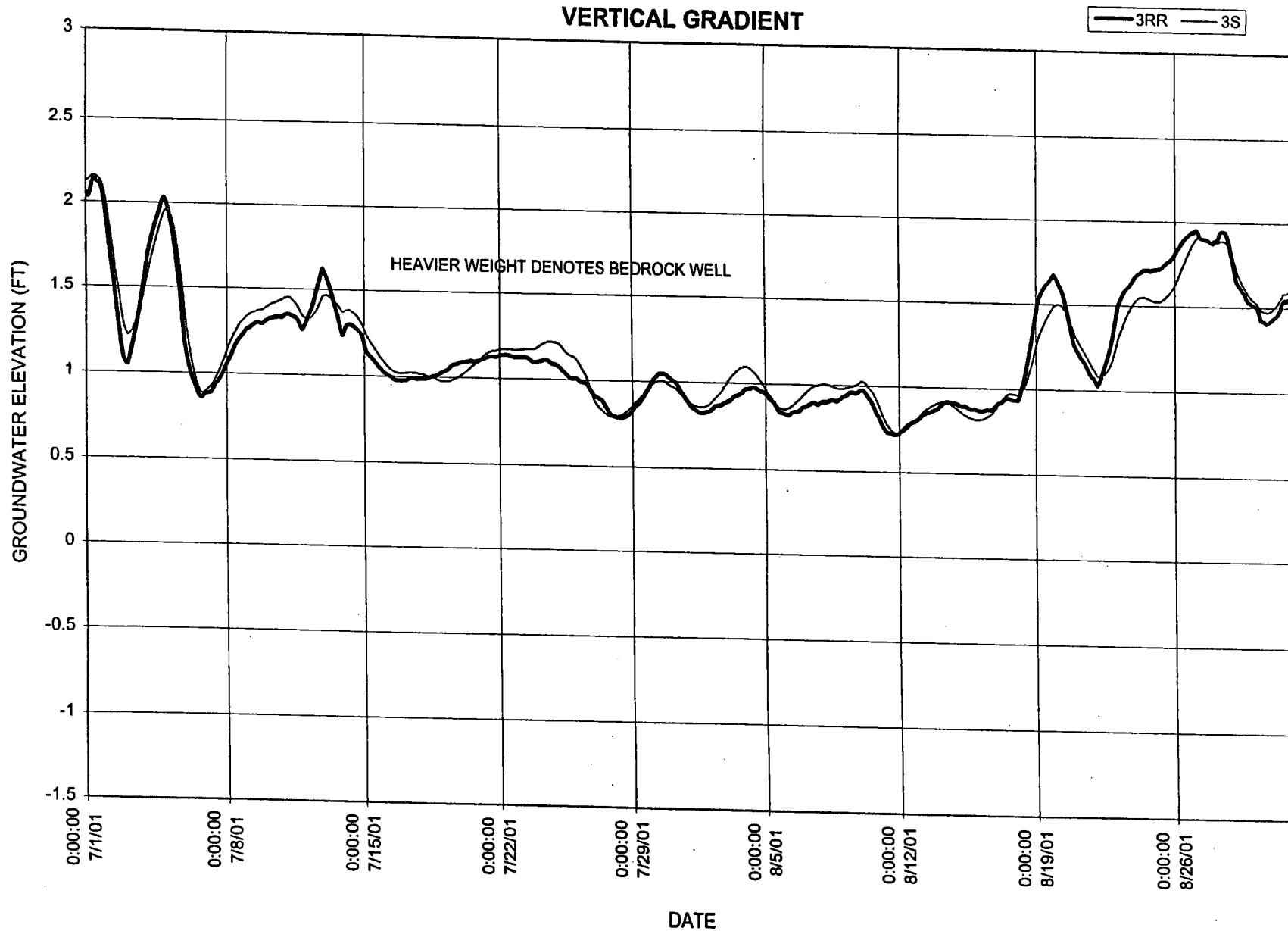
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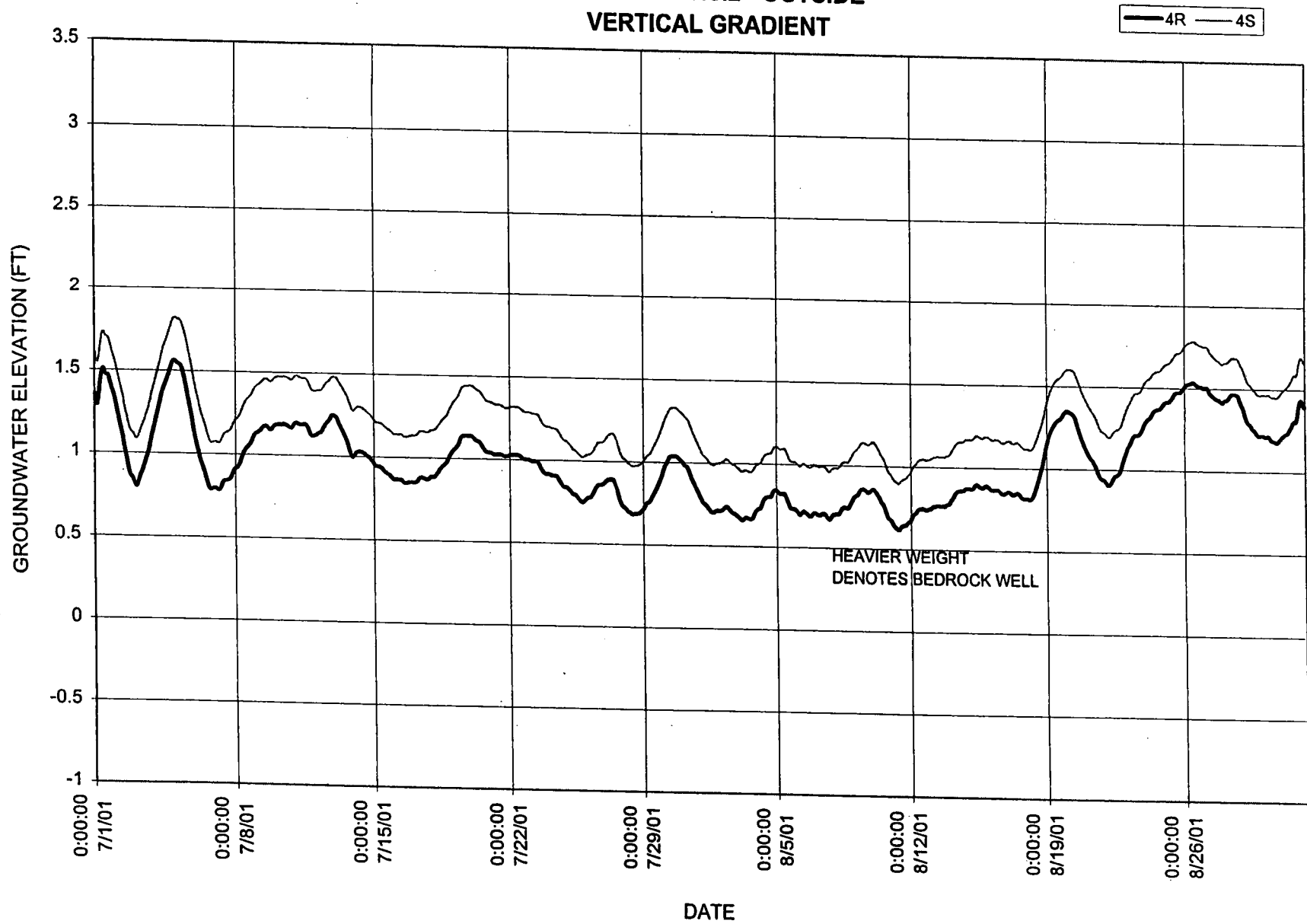
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SAND & GRAVEL UNIT



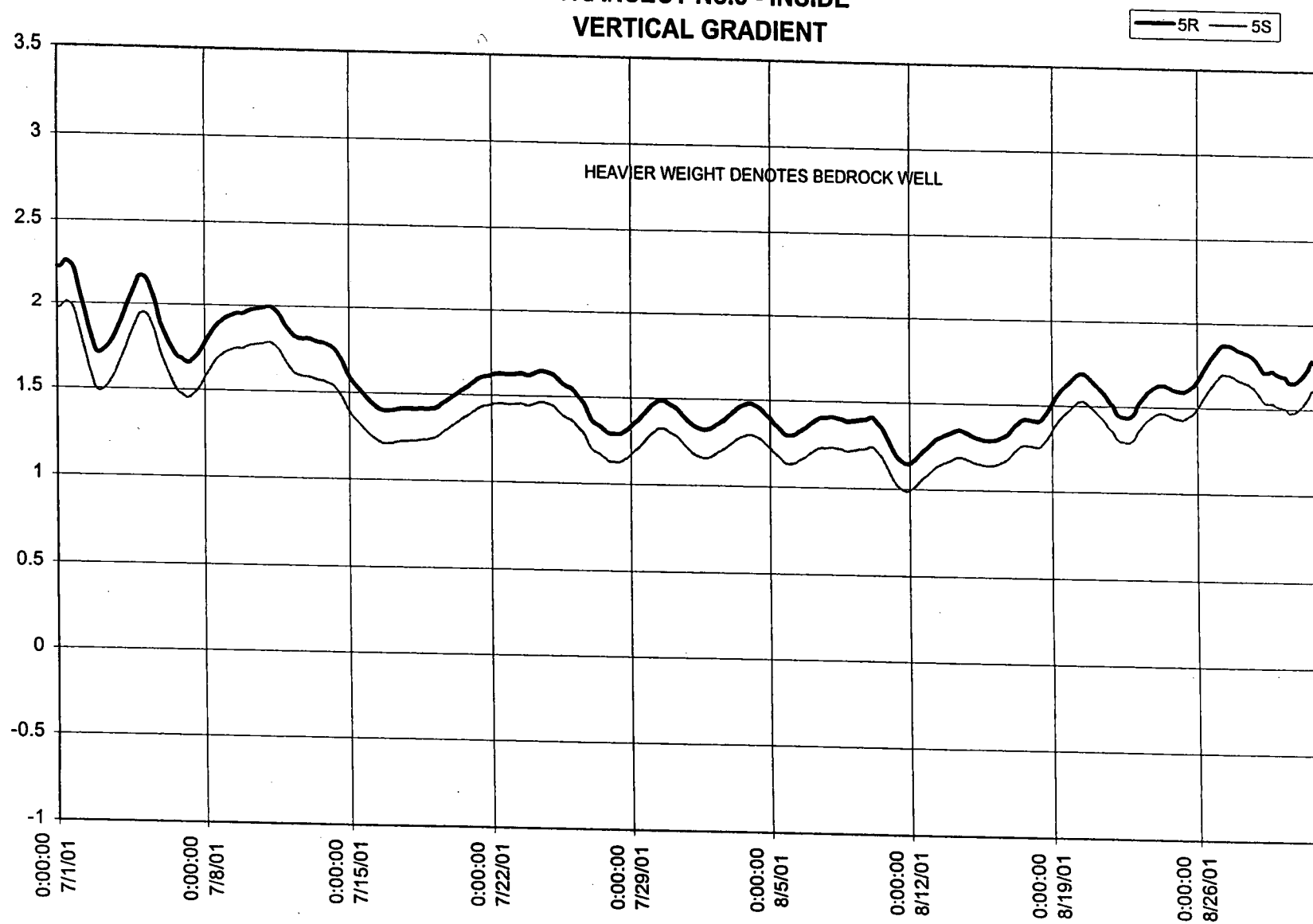
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TRANSECT No.2 - INSIDE
VERTICAL GRADIENT



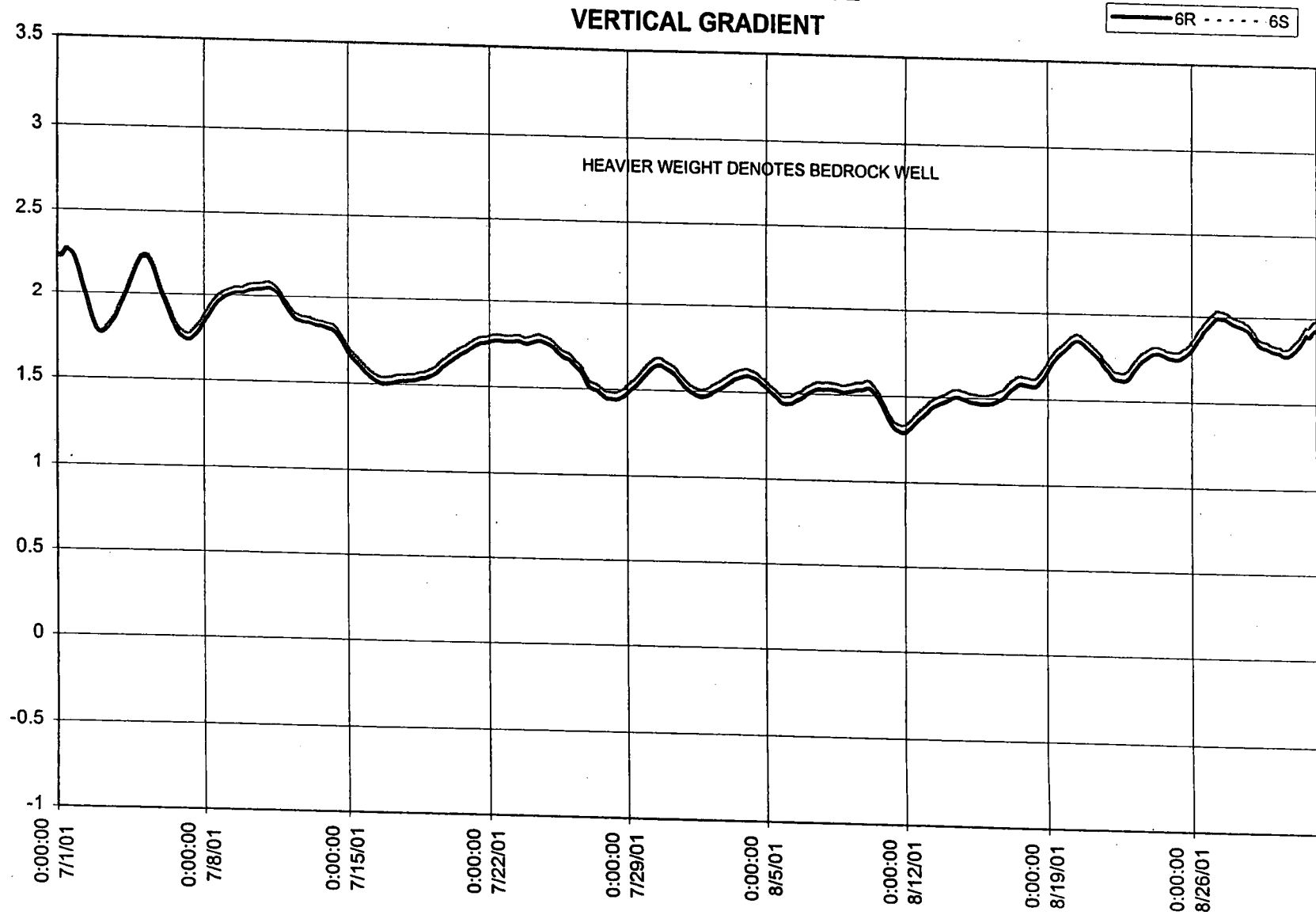
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VERTICAL GRADIENT



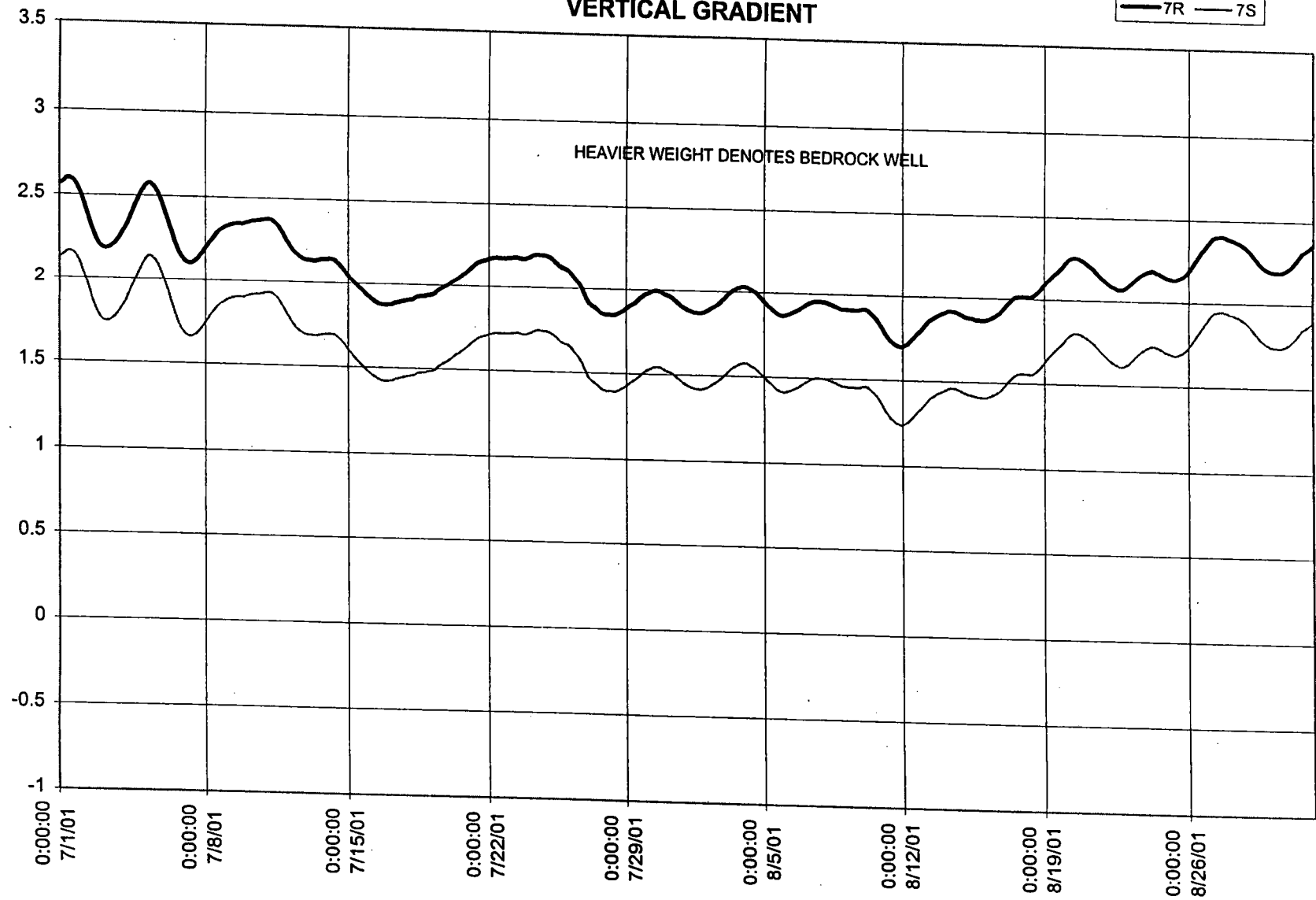
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TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



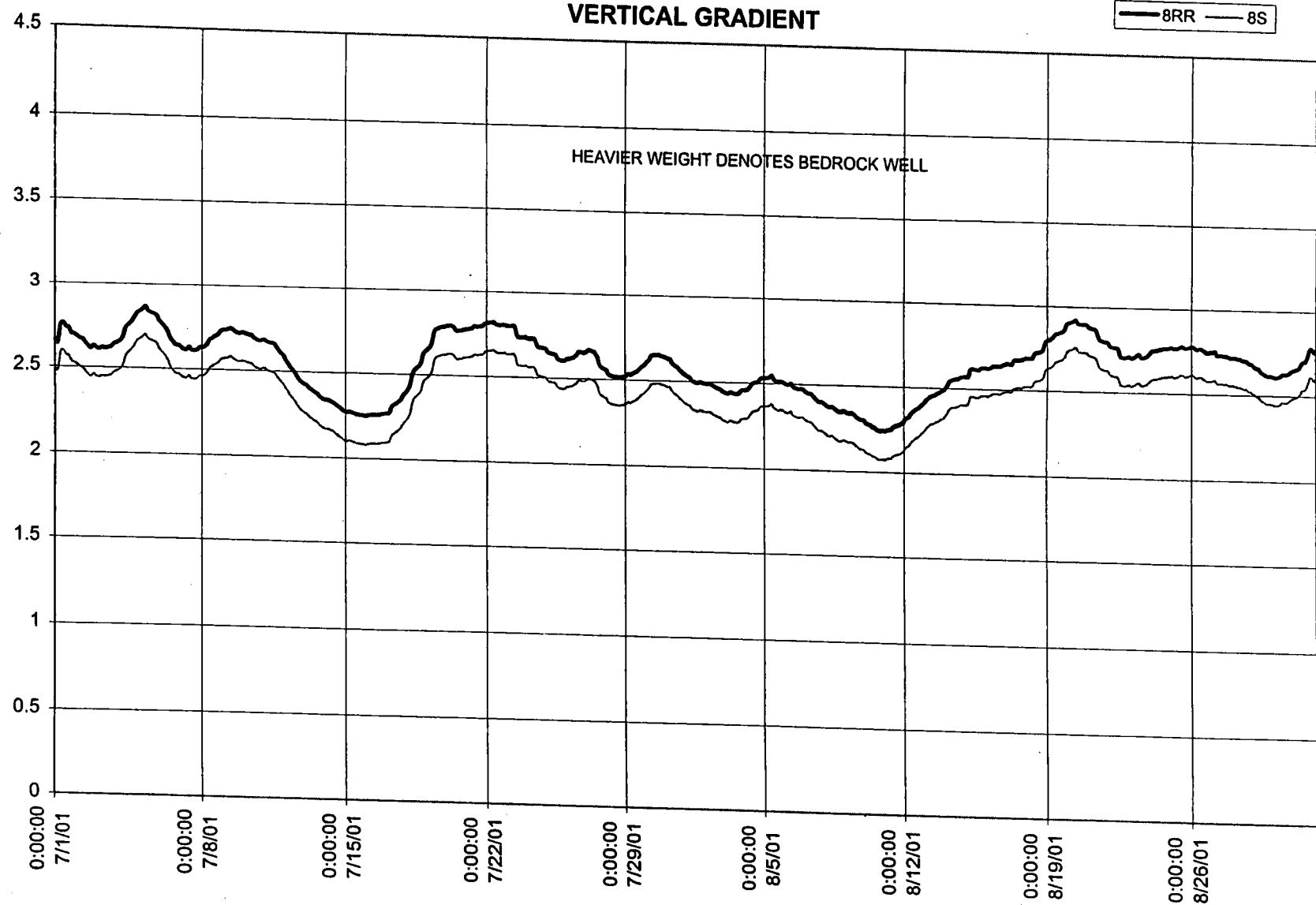
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #13
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #14
TRANSECT No.4- INSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
TRANSECT No.4- OUTSIDE
VERTICAL GRADIENT



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Fax. 201.512.5786

A Member of The IT Group

October 31, 2001

Project 791186

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for September 2001

Dear Mr. Januszkiewicz:

A site visit was completed on October 1, 2001 to download water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of September 2001 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA in mid-November.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. The continuous water level elevation data when compared with manual readings indicated that the Trolls are functioning properly and are recording accurate data, with the exception of the Troll in Well 15G. Downloading problems occurred between the data recorder and computer in Well 15G, and data was not collected. The Troll in Well 15G was removed, and it is anticipated that a new mini-Troll will be installed in the well during the next site visit in November.

On September 5, 2001, the Troll in Well 13G was removed and a new mini-Troll was installed in the well. This Troll is functioning properly and is recording accurate data. Hydrographs have been prepared for each of the transect locations and are enclosed for your reference.

The water levels in wells on the outside of the slurry wall vary significantly over the course of the day due to the tidal influence at the site. For clarity, Hydrograph Nos. 6 through 15 shows the average water level in the well over a 24-hour period (12 hours before, and 12 hours after).

Transect 1

Refuse (1G/2G)/Hydrograph No. 1 - Intragradiant conditions were not observed during the month. The average monthly water elevation for Well 1G (inside) and Well 2G (outside) was 12.68 and 11.83 feet msl, respectively. High water levels in Well 1G have been observed on several previous occasions and may be related to localized conditions around the well.

Water level elevation measurements taken from Leachate Collection Cleanouts Nos. 14 through 16 are included in Table 2, and indicate that the leachate collection system is functioning properly. The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in Well 1G do not indicate this condition.

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In an effort to further investigate the high water levels seen in Well 1G, approximately 1 well volume of groundwater was removed from the well (seen as a vertical drop in water levels on the hydrograph) on September 5, 2001. The groundwater level in Well 1G dropped over 2 feet, and only recovered approximately 0.25 feet over the remainder of the month. The reason for the limited recover of water levels in Well 1G is unknown at this point.

Transect 2

Refuse (3G/4G)/Hydrograph No. 2 - Intragradiant conditions were not consistently observed during the month. Intragradiant conditions were observed in the beginning of the month until approximately September 9, 2001. Groundwater levels outside of the slurry wall decreased over the first week of the month, and remained low over the remainder of the month. The average monthly water elevation for Well 3G (inside) and Well 4G (outside) was 10.56 and 10.60 feet msl, respectively. The monthly averages were within 0.2 feet; however, there appears to be a small inward gradient.

Sand and Gravel (3S/4S)/Hydrograph No. 6 - Intragradiant conditions were not consistently observed during the month. The average monthly water elevations for both Well 3S (inside) and Well 4S (outside) was 1.58 feet msl. Intragradiant conditions were established at the end of the month.

Vertical Gradient (3S/3RR)-Inside/Hydrograph No. 10 - Upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units inside the slurry wall. The average monthly water elevation for Well 3S (sand & gravel) and Well 3RR (bedrock) was 1.59 and 1.58 feet msl, respectively.

Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 - The vertical gradient between the bedrock and overlying sand & gravel units was in a downward direction throughout the month. The average monthly water elevation for Well 4S (sand & gravel) and 4R (bedrock) was 1.58 and 1.32 feet msl, respectively.

Transect 3

Refuse (5G/6G)/Hydrograph No. 3 - Intragradiant conditions were maintained throughout the month.

Sand and Gravel (5S/6S)/Hydrograph No. 7 - Intragradiant conditions were maintained throughout the month.

Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 - Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month.

Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 - Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry

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wall. The difference in average monthly water elevations for Well 6S (sand & gravel) and Well 6R (bedrock) was less than 0.2 feet.

Transect 4

Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – The automatic data recorder for Well 13G, outside the wall, malfunctioned, and a new mini-Troll was installed into the well during the site visit of September 5, 2001. The automatic data recorder for Well 15G, inside the wall, also malfunctioned. Data in Well 15G was collected until August 14, 2001. The August manual water elevations for Well 13G was 6.58 feet msl, and the September manual water elevations for Well 15G was 0.92 feet msl. These readings suggest significant intragradient conditions are being maintained at this location.

Sand and Gravel (7S/8S)/Hydrograph No. 8 - Intragradient conditions were maintained throughout the month.

Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 - Due to an upward gradient between the sand & gravel and refuse units in the oil seeps area, groundwater was not collected from the sand & gravel unit. Hydrograph No. 9 shows the ambient conditions between Wells 15S (outside) and Well 13S (inside) in the sand & gravel unit. Water levels from Well 15G in the refuse unit are included on the hydrograph for comparison.

Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 - Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month.

Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 - Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month.

Transect 5

Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month.

Figure 1 shows the hydraulic profile summary for September 2001.

Groundwater and Leachate Collection

Based on data provided by U.S. Filter, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from September 1 to September 30, 2001:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	242,520 gal.	160,415 gal.	0 gal.	39,369 gal.
0 gpd	8,084 gpd	5,347 gpd	0 gpd	1,312 gpd

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For the period, a total of 402,935 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells of 13,431 gpd is below the recommended extraction rate of 15,000 gpd. The extraction rate from S&G No. 2 of 8,084 gpd is below the recommended extraction rate of 10,000 gpd. The extraction rate from S&G No. 3 of 5,347 gpd meets the recommended extraction rate of 5,000 gpd. At Transect 2, intragradient conditions were not maintained in the sand & gravel unit across the slurry wall and upward gradient conditions were not imposed between the bedrock and overlying sand & gravel units. Groundwater collection from S&G No. 2 should be increased to the recommended 10,000 gpd, which may impose the desired hydraulic gradients at Transect 2.

The leachate extraction rate of 1,312 gpd does not meet the recommended rate of 1,500 gpd. Intragradient conditions were maintained in the refuse unit at all of the transect locations throughout the month with the exception of Transects 1 and 2. As discussed earlier, leachate levels in the collection system cleanouts suggest that intragradient conditions are being maintained at Transect 1 even though water levels in the monitoring wells do not indicate this condition. Intragradient conditions were not consistently maintained in the refuse unit of Transect 2. Leachate collection should be increased to 1,500 gpd, which may impose an inward gradient across the slurry wall at Transect 2.

CONCLUSIONS

- Intragradient conditions were maintained in the refuse unit at Transects 3, 4, and 5.
- Intragradient conditions were not observed for the entire month of September in the refuse unit at Transect 2.
- Intragradient conditions were not indicated by the monitoring wells in the refuse unit at Transect 1, although there is evidence that intragradient conditions may be present at this location.
- Intragradient conditions were maintained in the sand & gravel unit at Transects 3 and 4. Intragradient conditions were not consistently observed in the sand & gravel unit at Transect 2.
- Inside the slurry wall, upward gradient conditions were observed between the bedrock and overlying sand & gravel unit at Transects 3 and 4. Upward gradient conditions were not consistently observed at Transect 2.
- Outside the slurry wall, upward gradient conditions were observed between the bedrock and overlying sand & gravel unit at Transect 4. Upward gradient conditions were not consistently observed at Transect 3, and an upward gradient condition was not observed at Transect 2.

Mr. Carl Januszkiewicz
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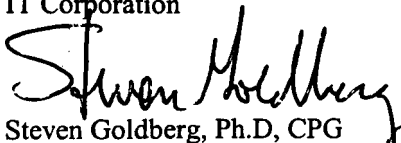
RECOMMENDATIONS


- The leachate collection rate should be increased to 1,500 gpd from the September average of 1,312 gpd.
- Groundwater extraction rates should be increased at S&G No. 2, which may impose a more consistent upward gradient. The extraction rate should be increased to the recommended 10,000 gpd from the September average of 8,084 gpd. If the existing conditions persist it may be necessary to increase the collection rate at this location.
- The collection rate for S&G No. 3 should be maintained at or above 5,000 gpd.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

Sincerely,

IT Corporation


Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist


Thomas Connors, P.E.
Project Manager

Attachments

cc: Glenn Grieb, US Filter

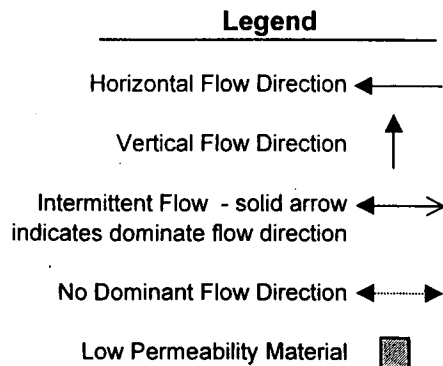
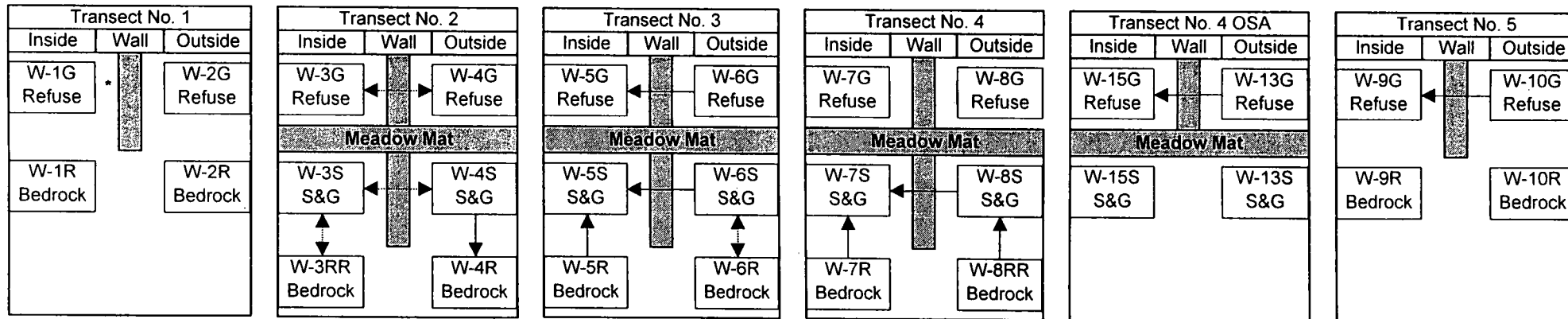
Table 1
KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2001 Minimum/Maximum Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation	Well ID	Monitoring Period	Minimum Recorded Water Elevation	Maximum Recorded Water Elevation	Average Water Elevation
W-1G	July	12.32	15.61	14.13	W-2G	July	12.64	13.66	13.22
	August	14.26	14.99	14.62		August	12.09	13.09	12.81
	September	11.91	14.44	12.68		September	11.51	12.75	11.83
	3rd Quarter	11.91	15.61	13.82		3rd Quarter	11.51	13.66	12.63
W-3G	July	10.47	10.92	10.70	W-4G	July	10.67	11.45	11.03
	August	10.45	10.84	10.64		August	10.59	10.99	10.74
	September	10.40	10.74	10.56		September	10.50	10.92	10.60
	3rd Quarter	10.40	10.92	10.63		3rd Quarter	10.50	11.45	10.80
W-3S	July	0.69	2.25	1.22	W-4S	July	0.27	2.63	1.29
	August	0.67	1.99	1.18		August	0.32	2.53	1.26
	September	1.02	2.18	1.58		September	0.58	2.94	1.58
	3rd Quarter	0.67	2.25	1.32		3rd Quarter	0.27	2.94	1.37
W-5G	July	10.34	11.19	10.73	W-6G	July	12.33	13.41	12.88
	August	10.32	11.07	10.82		August	12.27	12.99	12.63
	September	10.36	11.09	10.69		September	12.17	12.92	12.48
	3rd Quarter	10.32	11.19	10.75		3rd Quarter	12.17	13.41	12.66
W-5S	July	0.96	2.16	1.47	W-6S	July	1.29	2.45	1.80
	August	0.89	1.93	1.31		August	1.22	2.45	1.66
	September	1.13	2.13	1.60		September	1.46	2.44	1.93
	3rd Quarter	0.89	2.16	1.46		3rd Quarter	1.22	2.45	1.80
W-7S	July	1.30	2.27	1.69	W-8S	July	1.79	4.07	2.45
	August	1.20	2.05	1.58		August	1.84	4.17	2.42
	September	1.50	2.33	1.83		September	1.92	4.25	2.56
	3rd Quarter	1.20	2.33	1.70		3rd Quarter	1.79	4.25	2.47
W-15S	July	2.00	3.00	2.42	W-13S	July	1.79	3.14	2.29
	August	1.93	2.98	2.36		August	1.75	3.21	2.23
	September	2.15	3.28	2.56		September	1.91	3.40	2.40
	3rd Quarter	1.93	3.28	2.44		3rd Quarter	1.75	3.40	2.31
W-15G	July	0.74	0.87	0.81	W-13G	July 1-5	6.39	6.85	6.63
	August 1-14	0.79	0.87	0.82		August 14	NA	NA	6.58*
	September 5	NA	NA	0.92**		Sept. 5-30	6.13	6.63	6.35
	July-Aug. 14	0.74	0.87	0.81		3rd Quarter	6.13	6.85	6.40
W-9G	July	7.66	8.25	7.93	W-10G	July	8.61	9.54	9.14
	August	7.62	8.20	7.95		August	8.35	9.04	8.69
	September	7.95	8.28	8.00		September	8.32	9.38	8.77
	3rd Quarter	7.62	8.28	7.96		3rd Quarter	8.32	9.54	8.87

Table 2
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

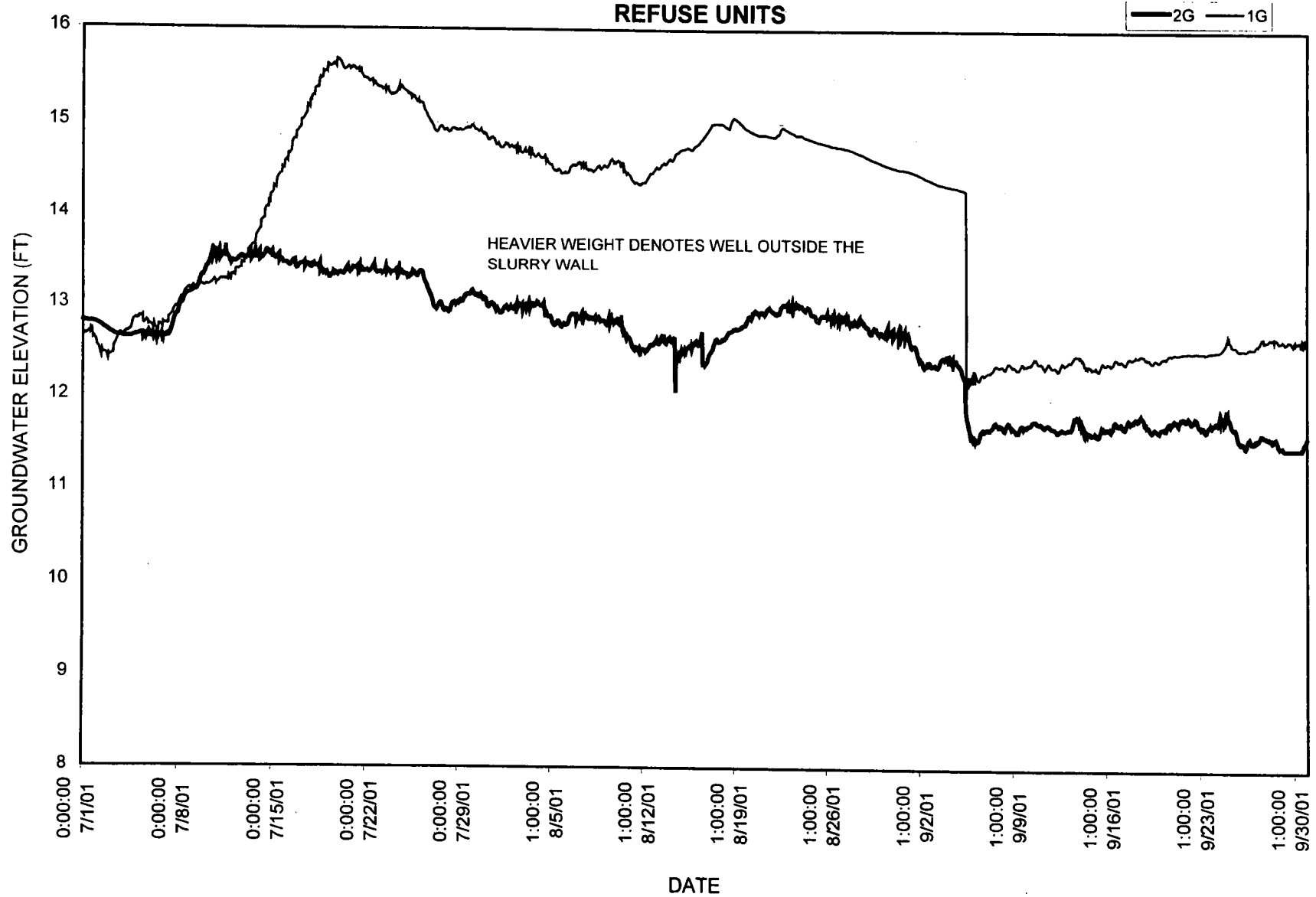
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Figure 1
Kin-Buc Landfill
Hydraulic Profile Summary
September 2001

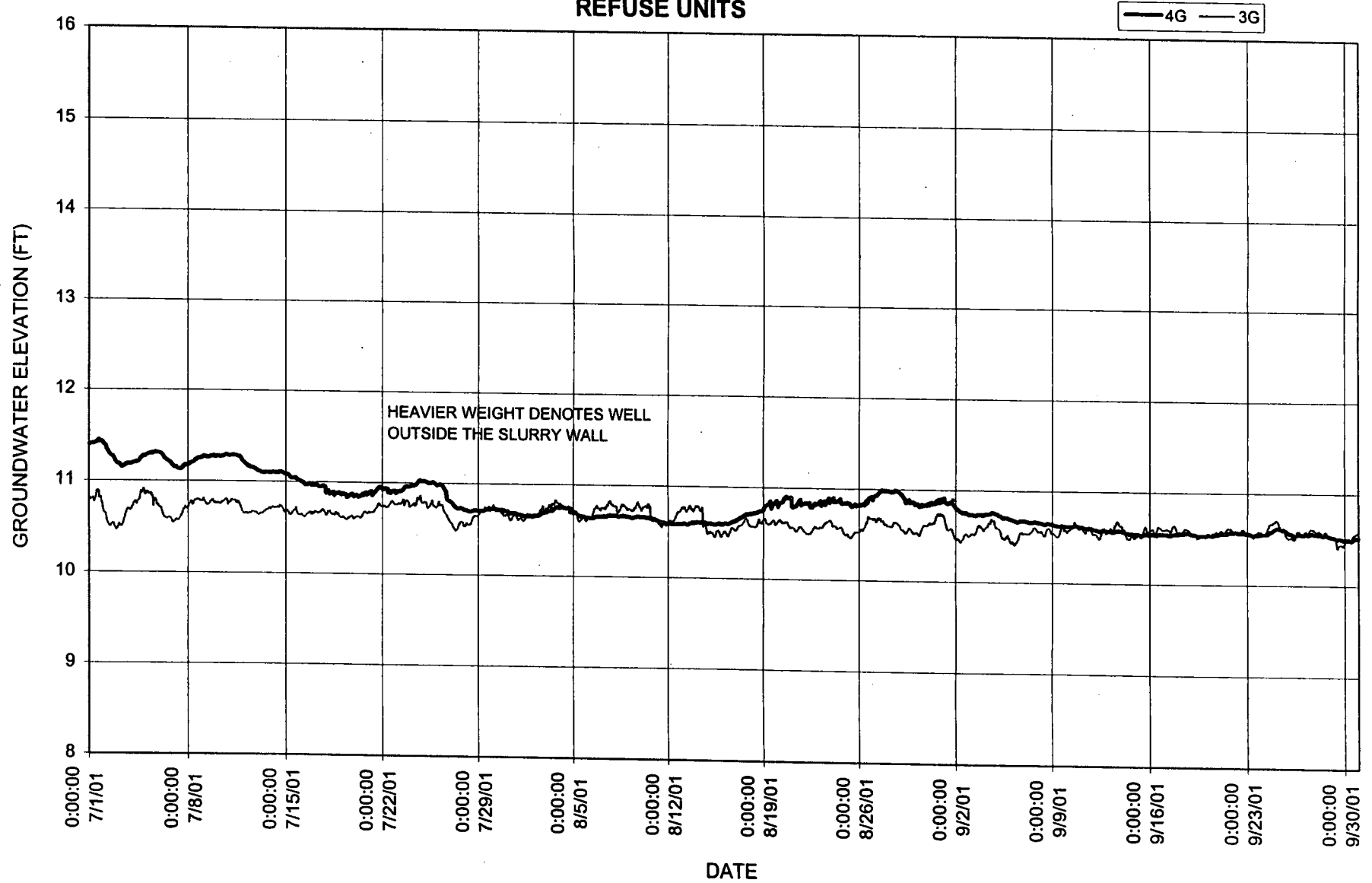


NOTE: * The fact that the leachate collection system is functioning properly suggests that intragradiant conditions are being maintained at Transect 1, even though water levels in well W-1G do not indicate this condition.

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
TRANSECT No. 1
REFUSE UNITS

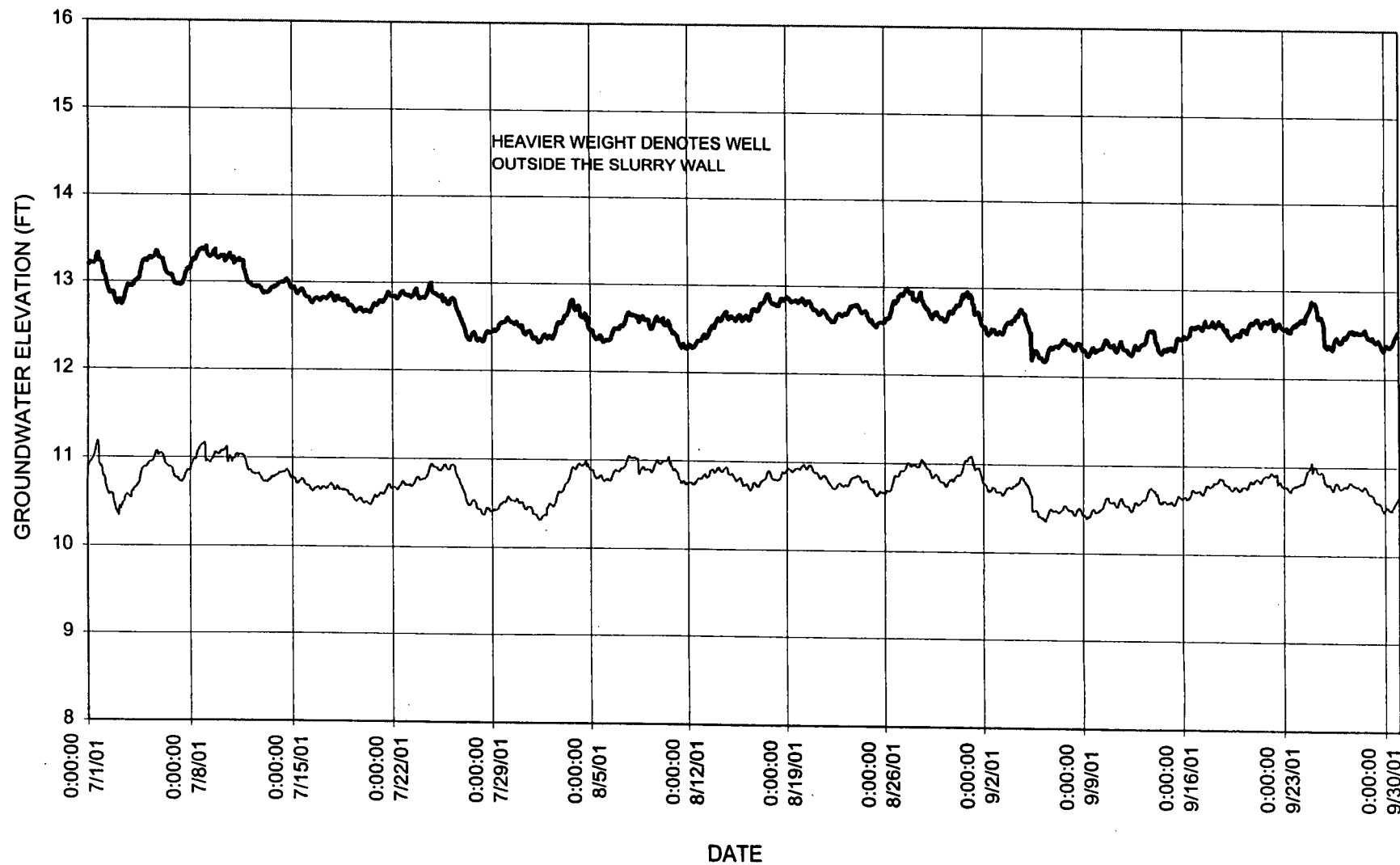


KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #2
TRANSECT No.2
REFUSE UNITS

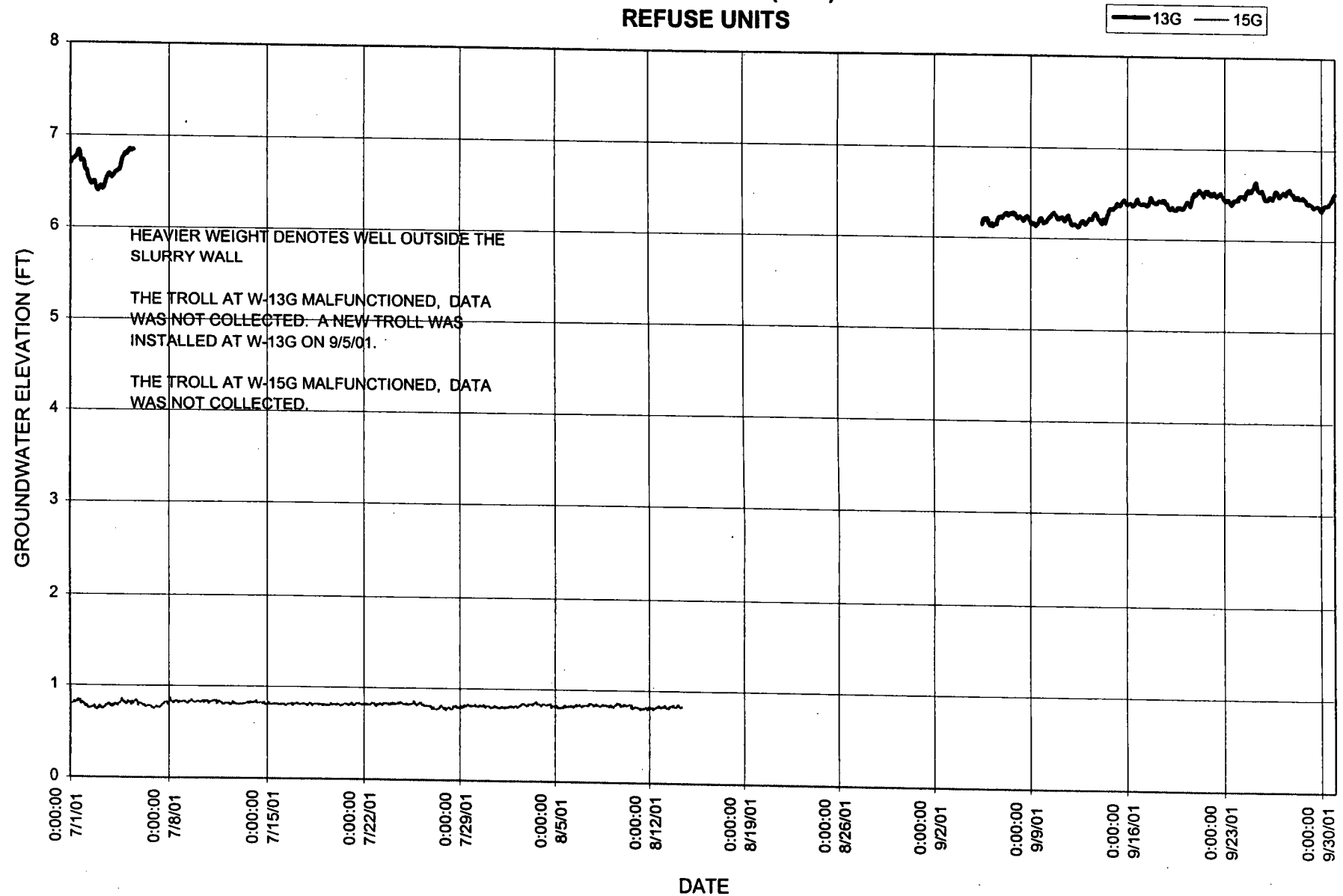


KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH # 3
TRANSECT No.3
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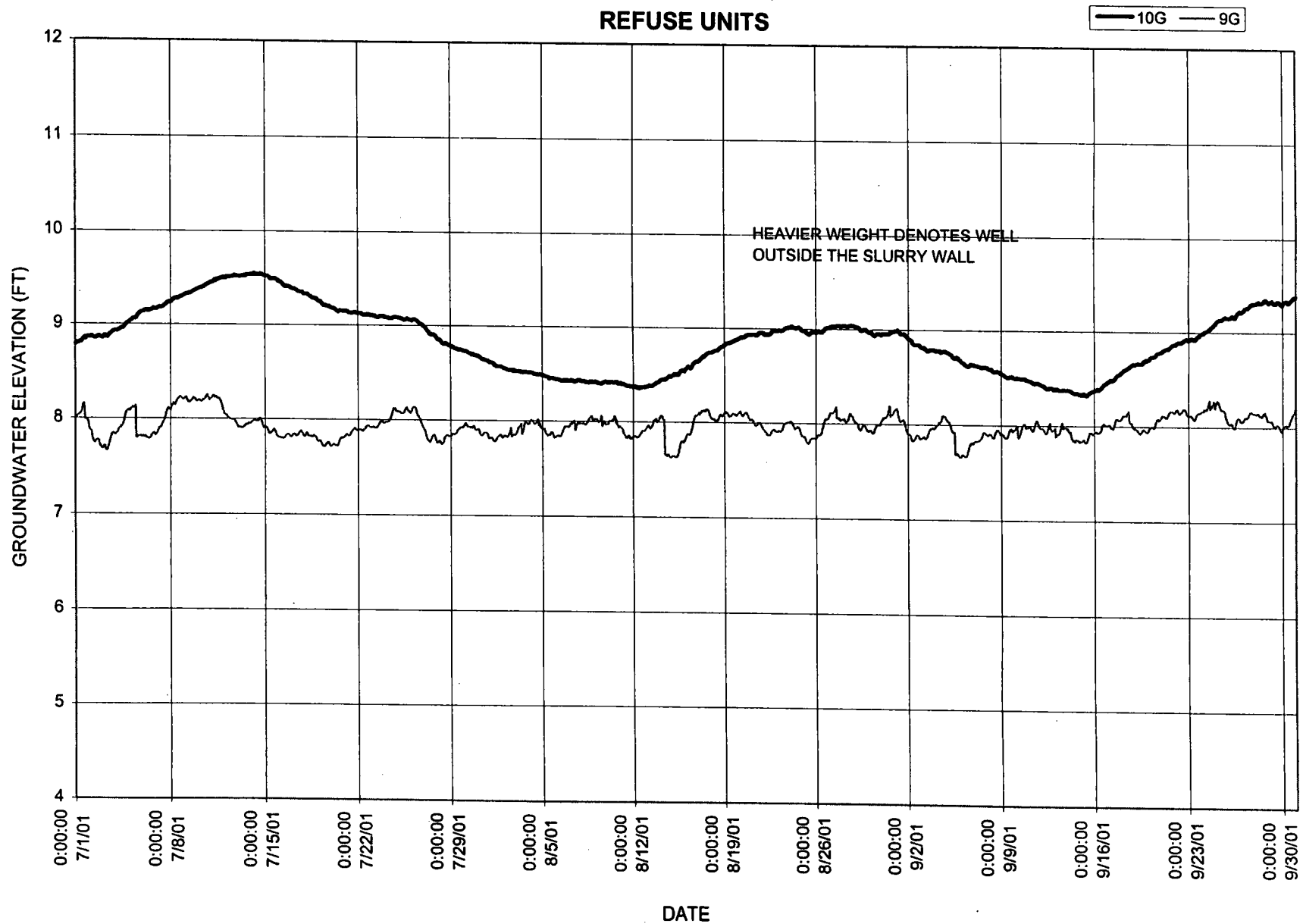
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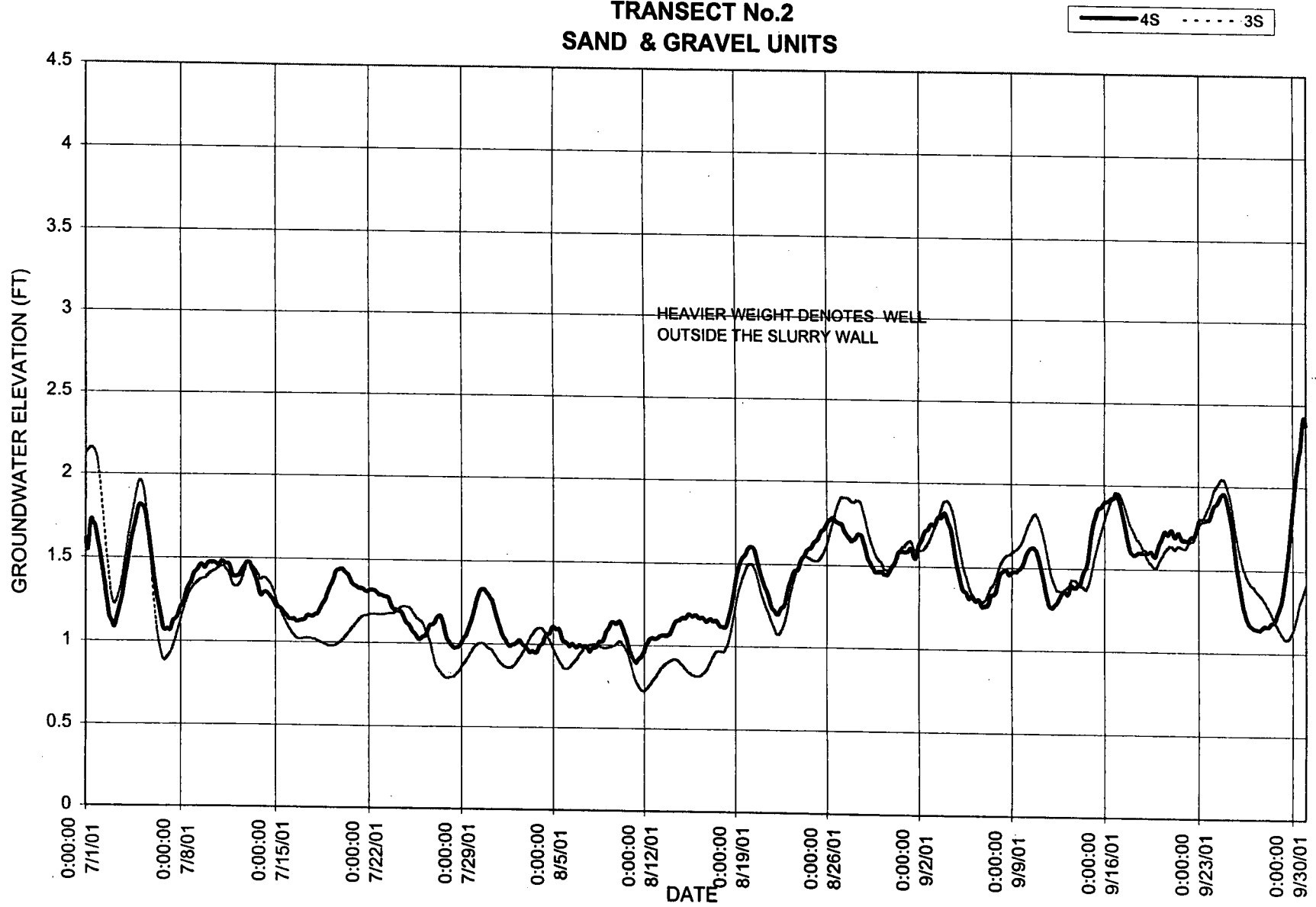
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TRANSECT No.4 (OSA)
REFUSE UNITS



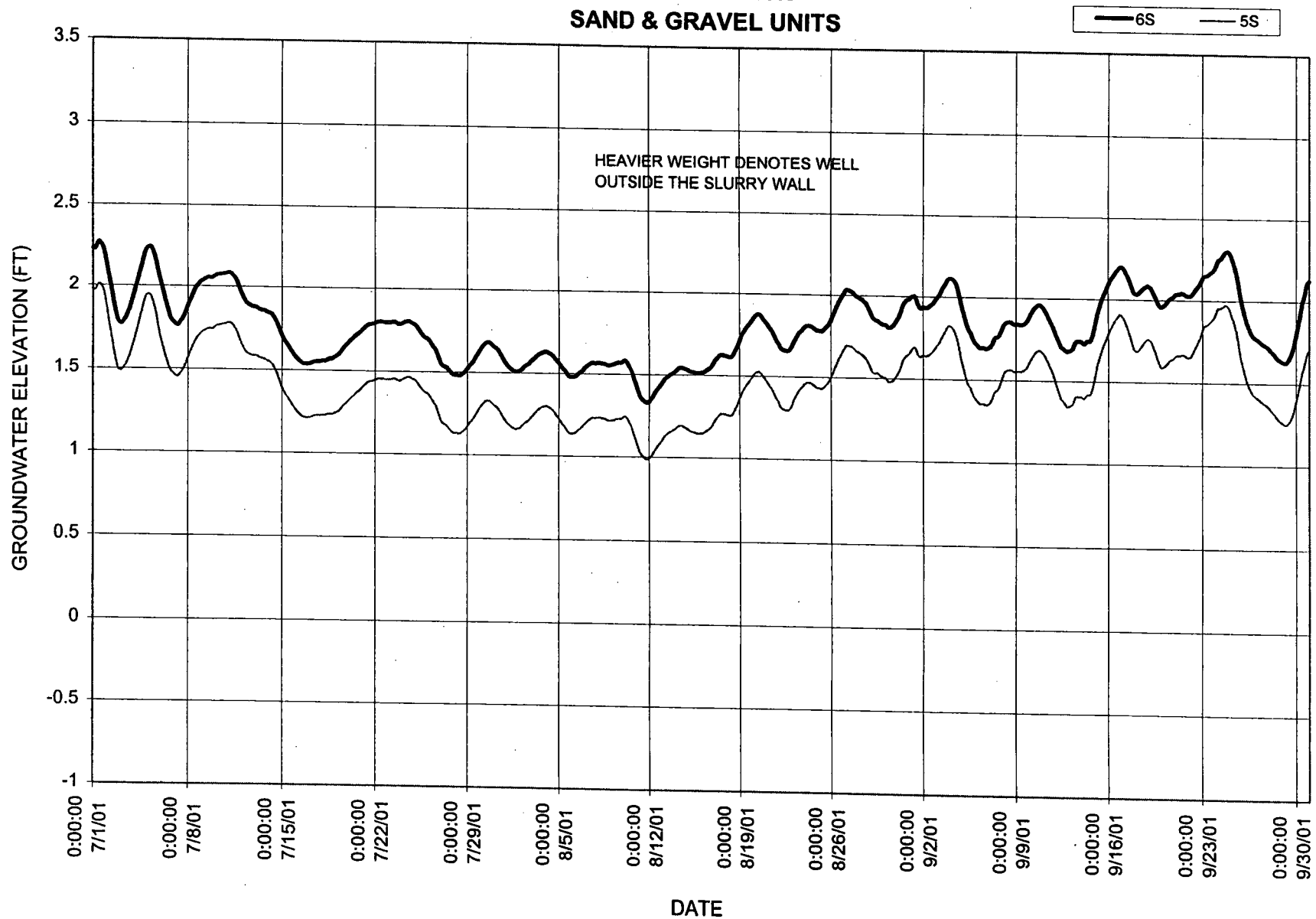
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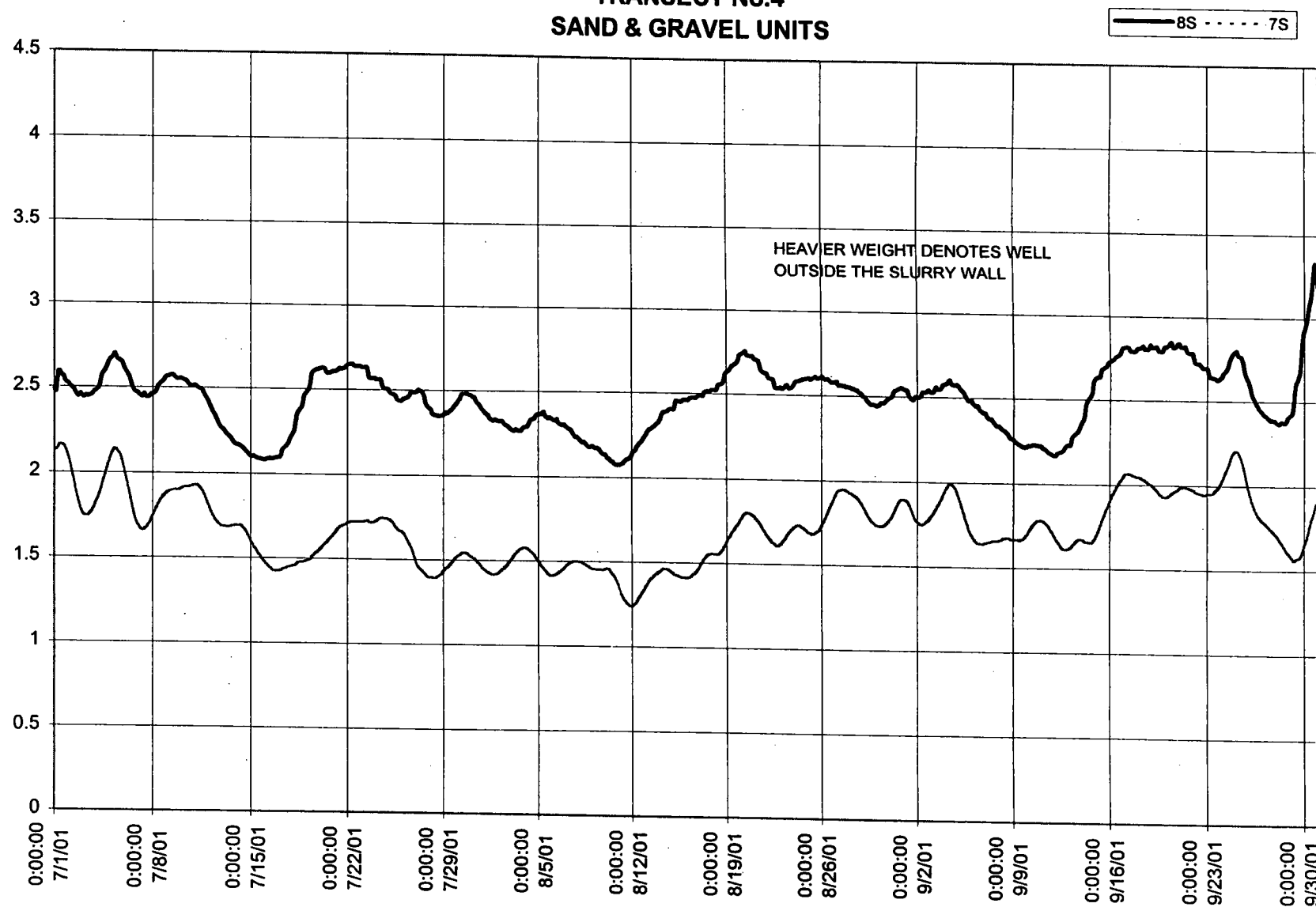
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SAND & GRAVEL UNITS



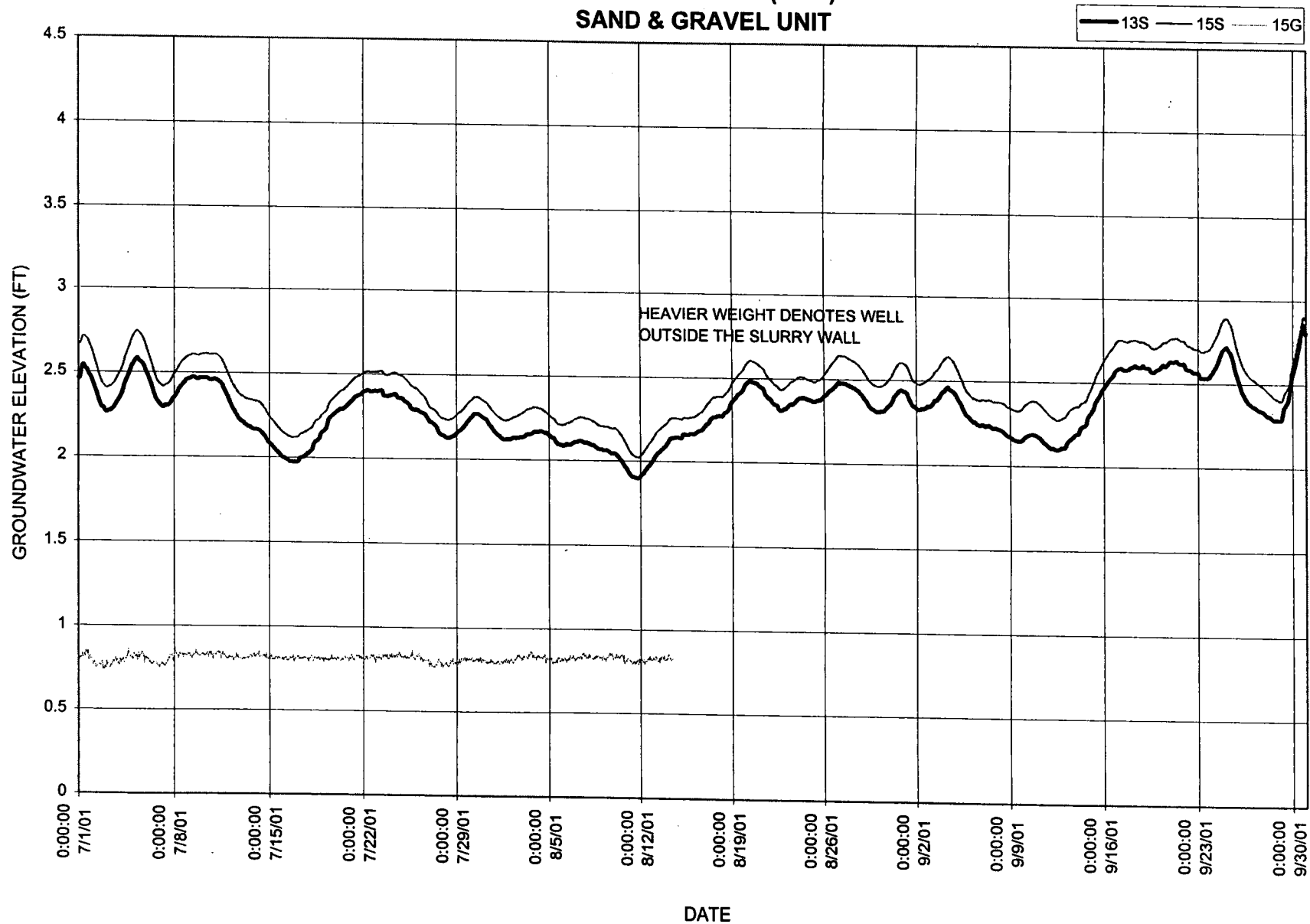
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SAND & GRAVEL UNITS



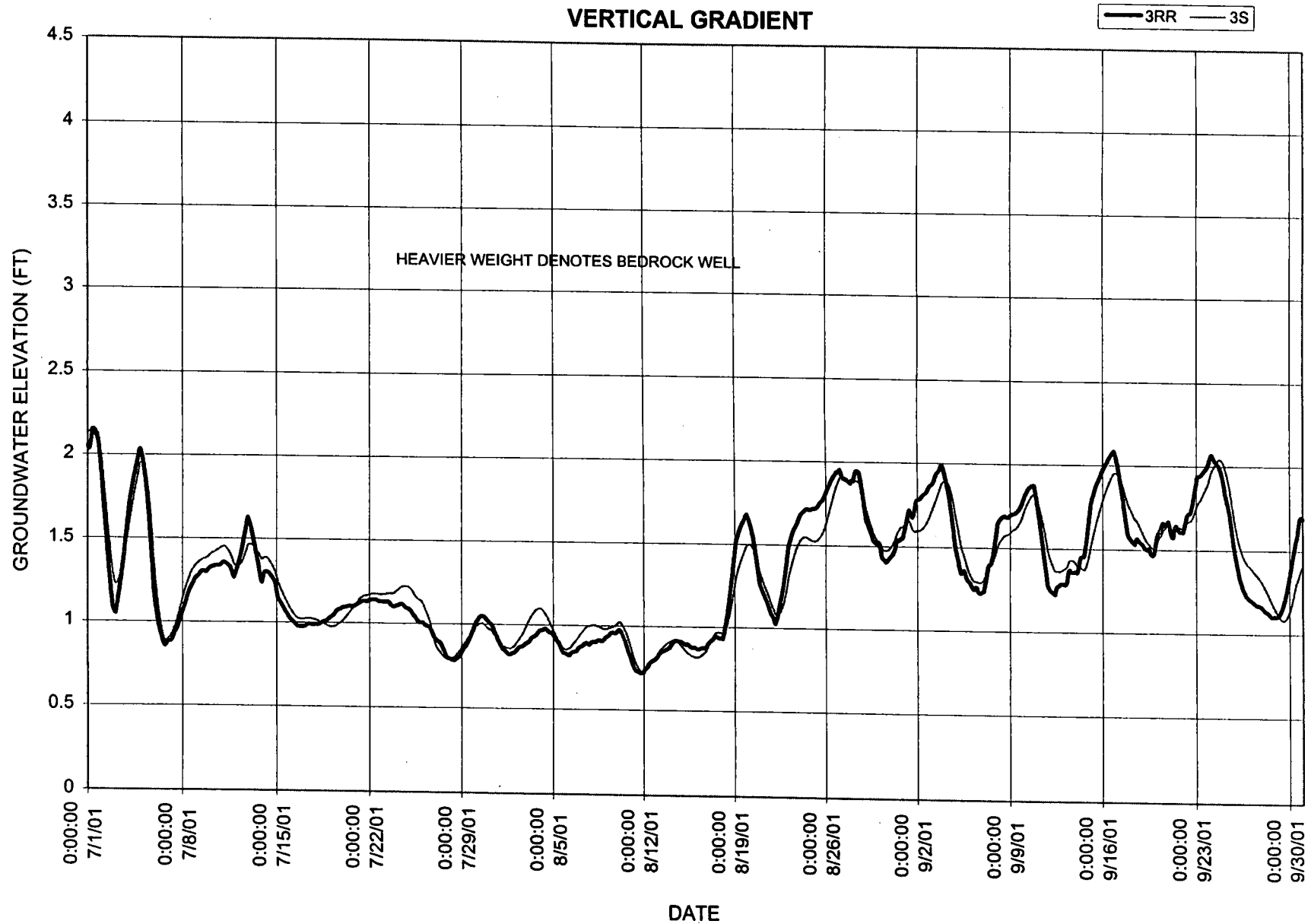
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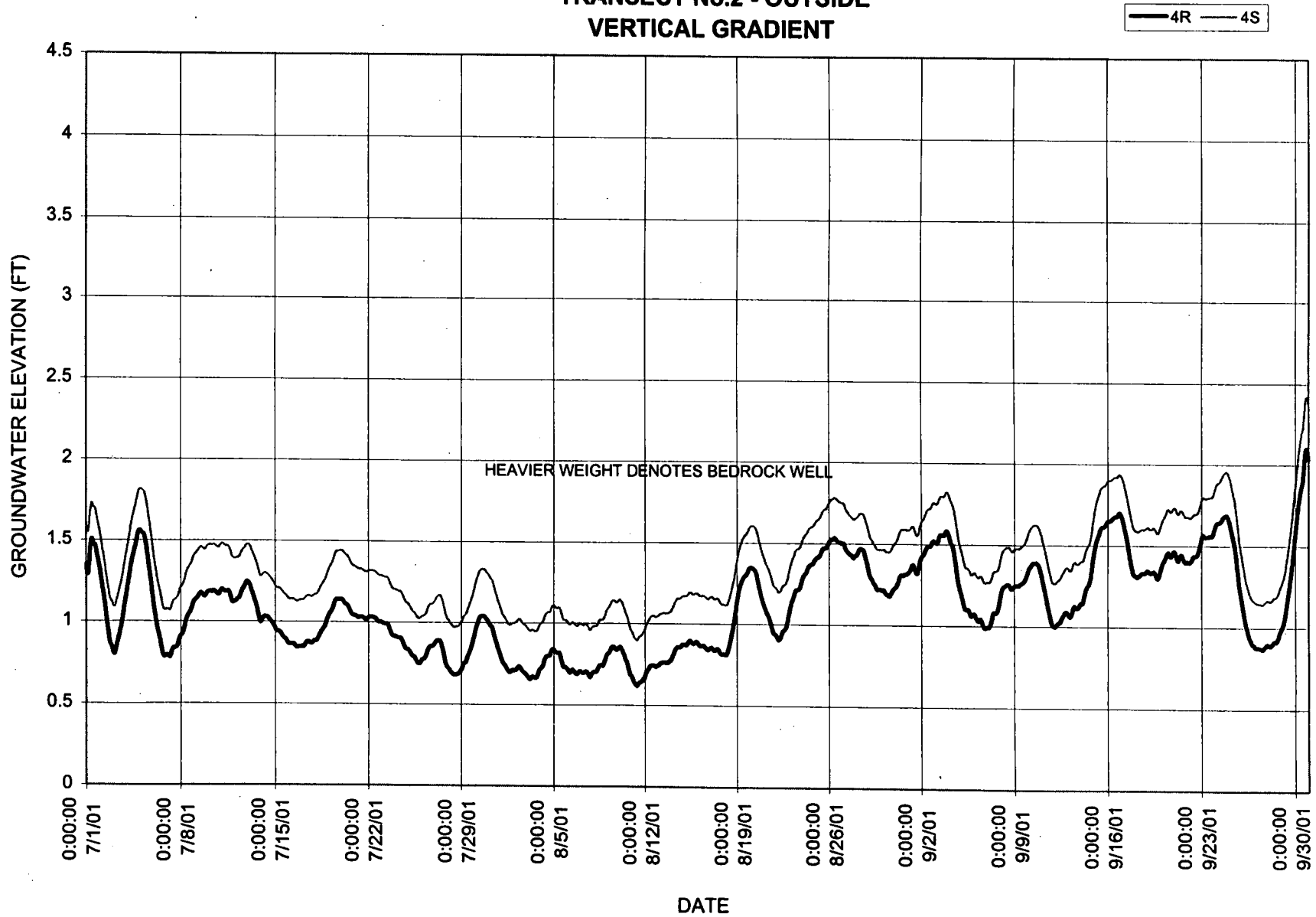
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SAND & GRAVEL UNIT



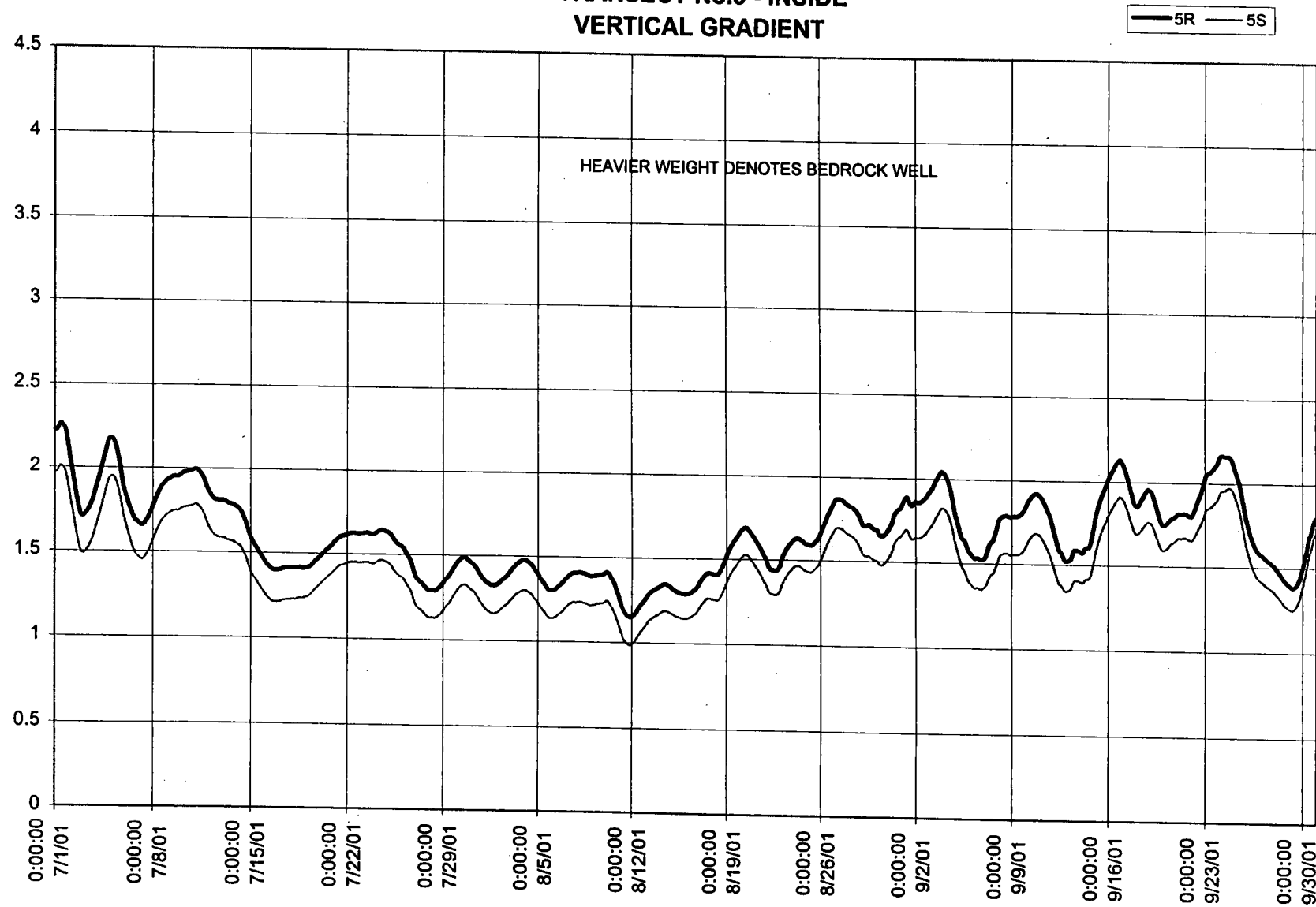
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #10
TRANSECT No.2 - INSIDE
VERTICAL GRADIENT



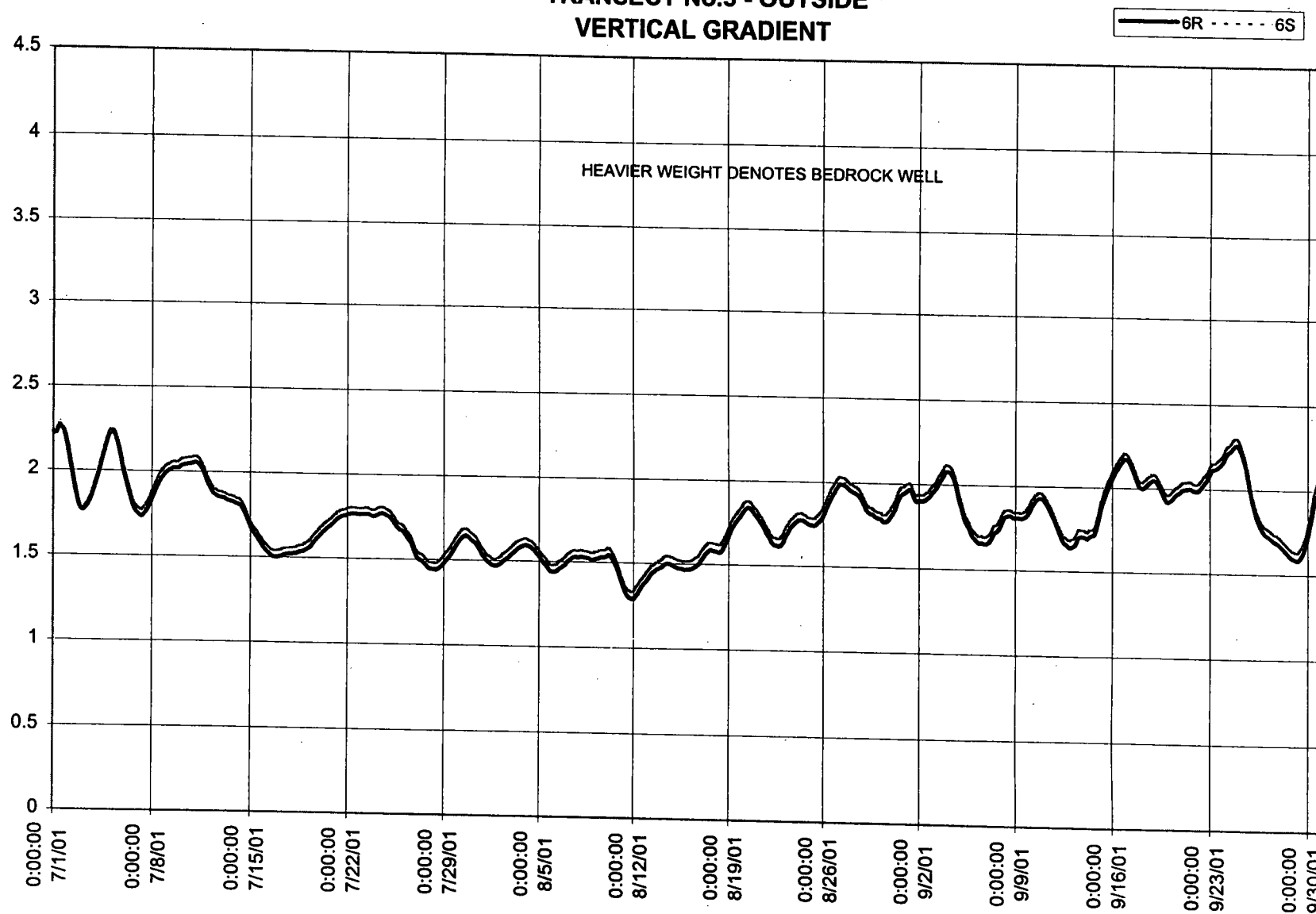
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #11
TRANSECT No.2 - OUTSIDE
VERTICAL GRADIENT



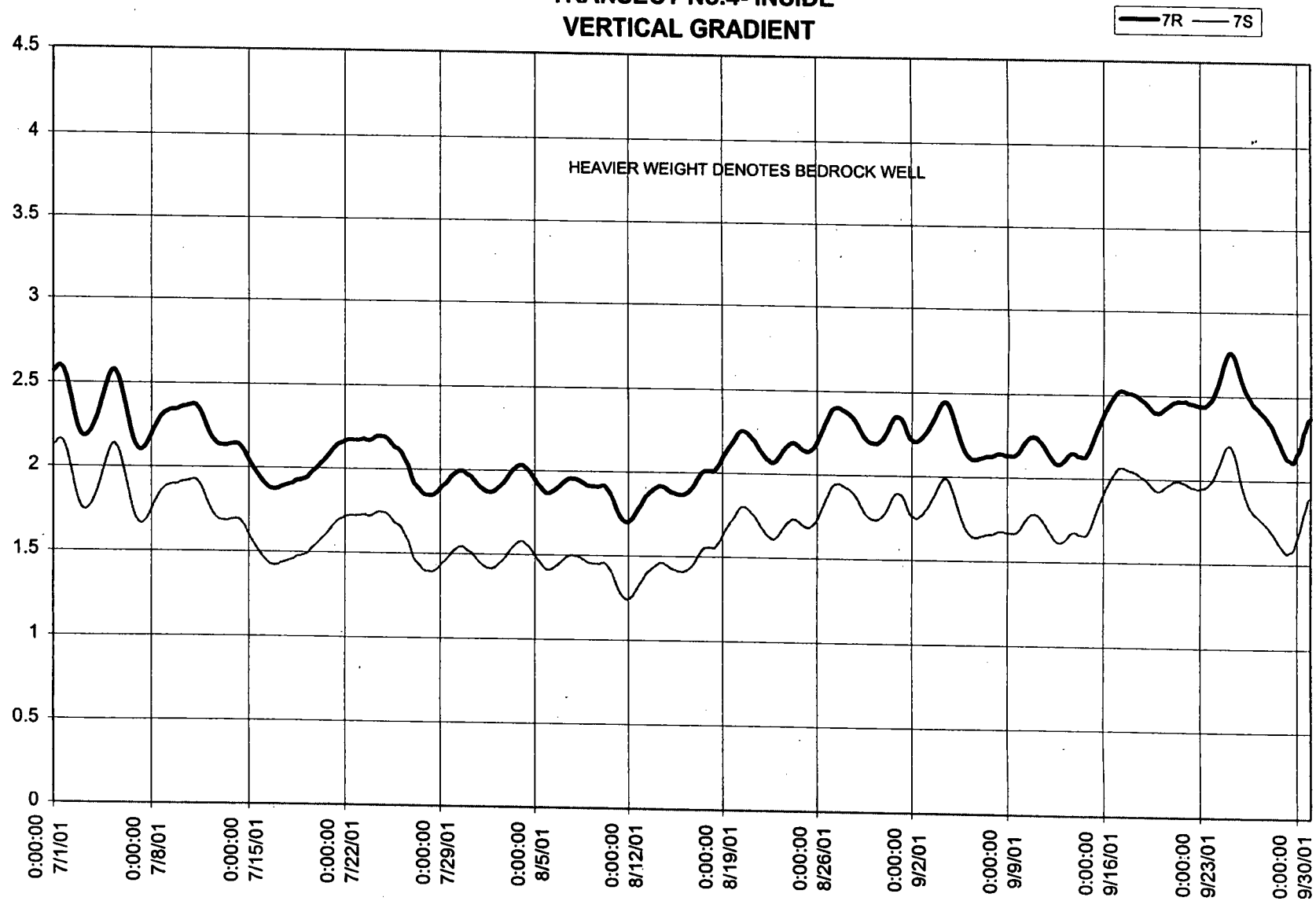
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #13
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #14
TRANSECT No.4- INSIDE
VERTICAL GRADIENT



KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
TRANSECT No.4- OUTSIDE
VERTICAL GRADIENT

